# Gas Journal

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# Editorial Notes

## Increased Appliance Costs

THE cost of household gas equipment and the effect of that cost on our sales problem have for many years been topics that were sure of eliciting argument at Gas Industry gatherings. Looking back we have to admit that, valuable as these discussions have been, the issue in practice has often been decided by circumstances entirely beyond our control, or at least not of our making. There are those who believe that this latter fact has sometimes reacted to our ultimate benefit, as, for example, in the case of the almost negligible extent to which standardization schemes have " taken on." Then there is the matter of coloured finishes and chromed parts. The variety and quality called for to-day by the evolution of public taste have undoubtedly kept up the initial cost of stoves and fittings, or at least offset certain savings effected in manufacturing practice. Yet the choice available and the attractiveness of these new finishes have undoubtedly been among the leading causes of the large increases in turnover of appliance sales in recent years.

But the back-wash of the armaments wave has now reached our territory. The result is that rising costs have eventuated, with no hope of inherent consequential advantage. There is no escaping these " reduced discounts " (to quote the customary notification) no matter how shrewd our buying policy. So it behoves the Industry in general and the appliance-sales organization in particular to take careful stock of the situation. In the absence of uniform distributive or selling conditions there can be no uniform national policy and thus, once more, on an issue of some consequence it devolves upon the individual undertaking or group to settle its own line of action. But there is one thing we shall all have to take into account, and that is the strong possibility of further advances on present prices—with the dubious consolation that other trades and services will be faced with the same situation.

The fact of the possibility of further increases should give pause to the hurried marking-up of price-tickets prompted by the understandable desire to take a short cut to continued solvency by immediately passing on to the consumer the advances notified by the appliance makers or factors. Because, first of all, we shall have to decide whether we are going to cover for contingent additional cost in any particular line, and, if so, to what extent, or alternatively look forward to altering our price-lists piecemeal until the peak is reached. In passing we ought, perhaps, to note that there are those who hold that a public to whom gas service has been " sold " will pay, within reason, anything we may ask for appliances which will enable it to enjoy the advantages of that service. Those who think this way will face the future with a confidence which is likely to be put to the practical test. But if circumstances have forced others to regard this question in another light, say, to the extent of believing that gas apparatus really did cost too much even before the present rise, what then? Logically, we must consider whether there is any alternative to passing on the increases to the consumer.

Some businesses claim to have avoided this by various plans such as the introduction or development of profitable side-lines; reorganization that has reduced on-cost, or more fairly distributed overhead charges; the initiation of market research directed from a new angle; or special drives to increase turnover in certain directions instead of leaving the sale to develop more or less fortuitously.

## How Can We Meet Them?

IF there is to be no loss but, on the other hand, some gain to the Gas Industry by a situation so arbitrarily forced upon it as the present one, may we not assume (without reflection on the Industry's general awareness) that such gain will be likely to originate principally in a new impetus being given to the salutary process of re-examining its present policy and performance? Is not this the time to ask ourselves whether there is scope for new adjustments and re-alignments? Can we afford to ignore procedure that has benefited other trades, or dismiss as inadmissible expedients the plans cited above?

Between some undertakings' ideas of a reasonable profit on " fittings account " and the views of those whose policy it is to sell appliances at or below cost to secure the load, there is notoriously a considerable difference. But no matter what level we take as datum we must remember that the factors which determine the ultimate " charge to consumer " are many and various. Let us glance at an item that has almost universal application —the charge for fixing appliances. A simple little thing, yet one that is of real importance, whether you have a few hundreds or many thousands of consumers, or em-

ploy one fitter or battalions of them complete with uniformed inspectors. For, in one form or another, this item appears on the consumer's bill and more or less colours his view of the installation—a truism which, of course, is appreciated by the veriest junior. On the other hand, how many sales chiefs know exactly what it is costing to-day in labour and supervision alone to fix, say, the average small cooker, large range, gas fire, wash-boiler, or gas-poker in (1) old property, (2) new dwellings, (3) business premises? Hair-splitting will not account for the actual differences that the same model will entail under the rough classifications indicated. Yet how many are content, where an inclusive price has to be quoted, to put on a fixed percentage, or to strike an average by what is called " expert guesswork "? And how long do such percentages stand uncorrected to the incidence of district conditions which change far more rapidly to-day than formerly?

A case in point has come to our notice where the standard fixing charge for any cooker was fifteen shillings —a figure that was probably quite justified in the days when the proportion of new to replacement stoves was much higher than at present, or when builders of house property did not often carcase for gas heating. A recent analysis in that area showed that over a considerable number of installations the cost per stove for fitter's time, material, and handling was well under seven shillings. If to that we should add, say, three shillings for supervision and contingencies, making the total a round ten shillings, we see what scope existed for adjustment in this particular case if wide questions of policy indicated the expediency.

Keen cut-pricing applied to public utility work is not to be generally advocated. There are districts where it is clearly of less importance than most other aspects of selling policy. But any undertaking nowadays may suddenly be faced with competitive conditions which force it to skin its margins. So at present, if never before, we owe it to all concerned to find some satisfactory mean between the former system, where it has been practised, of rough averaging and the impracticable ideal of a scientifically equitable charge to each consumer.

## Management and Salesmanship

This question of the consumer's outlay on his appliances goes much further than the point reached thus far in our review of the current situation. Accountancy and statistical analyses may point the way to necessary adjustments or re-valuations. But only skilled management can bring about real savings or concrete reductions in overall costs. Therein lies scope for much effort. It begins with a fearless and impartial handling of staff appointments and staff organization. It continues with a correct appraisement of the suitability of this or that line for our market, from which should follow a purchasing policy that is courageous and untrammelled. Such management as we have in mind employs the latest and best methods for the handling, storing, and transport of goods. It insists on a close liaison between the fitting-shop and the sales department, and embraces the testing of appliances as well as their maintenance when in use.

This comprehensive view of the less obvious functions of modern sales management has many adherents in the Gas Industry. But it requires more than approval of principles to make it effective. It must be pursued with a thoroughness and persistence that could challenge a check-up at each and every stage. That is not easy to-day, if only because this side of our Industry has not the tradition and experience behind it which characterize the manufacturing side, and also because the recruitment of the highest type of personnel has been delayed by tardy recognition of its true relative importance and often by inadequate remuneration.

Reverting to the specific question of rising costs, let us next suppose there is no help for it and that we are obliged to mark up our prices for stoves and fittings, even to a substantial extent. What then? We hear a good deal in these days of what goes by name of " marketing psychology." It probably does little harm and is quite entertaining if you have time for it. But whether or not we are believers in it in general, we must obviously arm ourselves with one psychological weapon as the initial effort in the attack on this problem. We must conquer " the will to fail," and must firmly resolve that higher prices alone shall not spoil our sales total record.

It is legitimate to tell consumers that the situation is not of our making. The effect of such a statement will depend entirely on how it is put. As it is a negative point, it will on the whole be better not to stress it, unless inescapably provoked. What we can stress with far greater prospects of success is " improvement," and the fact that to-day's appliances are a more economical proposition than ever before. Modernization of design has a big appeal, and fortunately our appliance makers have had the enterprise to capitalize it for us. With confidence we can go forth and show improvements in the durability of finishes, greater convenience and reliability in ignition devices, the silence and efficiency of modern burners, the sensitivity and ease of manipulation of the newer thermostats. Where, in addition, we can bring to bear the backing of better advertising, and invoke the aid of promotional rates of charge for gas, the outlook should not cause us as much concern as it otherwise might.

## Public Lighting

In an issue of the *Evening Standard* last week appeared an article on London's " diffused " lighting, in which it was stated that more than 300 miles of road will soon have " a new system of diffused lighting which eliminates shadows and which throws up, in strong silhouette, all persons and objects in the road." The system referred to is the Osira mercury discharge lamp, and it received an excellent boost at the hands of the *Evening Standard* Special Correspondent. This, however, is hardly surprising since the article was based on an interview with a lighting engineer of the General Electric Company, who expatiated on the subject of surface brightness in relation to visibility. " The old system of lighting," he explained, " treated the road as though pedestrians look down upon it as they would look upon a table. But the pedestrian is on the surface of the road and he sees, therefore, patches of light and shadow of varying intensity and density. That is why the old system is worse than useless; it is dangerous." Now we quite agree that street lighting which may be described as patchy—and there is plenty of it—may be worse from the point of view of public safety than no lighting at all; but we care nothing for the idea, advanced so assiduously by the electricians, and for obvious reasons, that surface brightness is the sole criterion of good lighting. As we have pointed out before in these columns, false deductions can all too readily be drawn by solely considering the visibility of objects some distance ahead on flat, straight roads. In our experience of driving at night we feel

more concerned about the losing of objects in dark spots where the road forms no backgound, as at bends, and so on, and the sudden unmasking of objects by moving traffic. No two thoroughfares have precisely the same requirements, and the lighting installation must be designed having regard to the peculiarities of the particular thoroughfare—bends, cross-roads, nature of background, undulation and nature of road surface.

Good lighting can be achieved as well by gas as it can by employing electricity as the illuminant, and, as is well known, gas is by far the more reliable. The *Evening Standard* article, however, would give the ordinary reader two main impressions—that the mercury vapour lamp is the solution to all lighting problems, and that the "old system," presumably including such installations as the gas lighting of Whitehall or Regent Street, for example, is useless. Which, of course, is nonsense. Gas can fulfil all the requirements of modern street lighting, and we know of recent examples where, after experience of the mercury vapour lamp, the authorities concerned have, in the interests of safety and efficiency, reverted to gas. Needless to say, that was in the area of a gas undertaking which takes the keenest interest in lighting, really believes that the lighting load can not only be retained but can be enormously extended, and has organized properly to ensure that its efforts will be rewarded with success.

## Too Much Apathy

We could point to many such undertakings, and it is a fact, of course, that the amount of gas sold for public lighting has grown year by year; it has practically doubled since 1920 and now amounts to over 13,000 million cu.ft. We should feel much more satisfaction about this, however, if we knew that every gas undertaking in the country was doing its best to bring its lighting up to modern standards. At present we are faced with the fact that in far too many instances apathy is displayed and there are far too many extremely bad examples of gas lighting which, if something is not done about them, will fall prey to electricity—whether it be filament, mercury vapour, or sodium. It is essential that every single unit of the Gas Industry should appreciate the value of the public lighting load; its retention is one of the strongest bulwarks against competition. Naturally the electricians are concentrating on the lighting load. The greater the amount of plant put down to meet the lighting demand, the more can the electricity industry offer cut rates at off-peak hours, with the aim of cutting into the day load of the Gas Industry and levelling the output curve. Our Industry as a whole must appreciate more fully that any loss of gas lighting goes much deeper than the mere loss of revenue entailed. It paves the way to the most intense form of electrical competition in other fields. Moreover, lighting has a prestige value and is a first-class advertisement.

The electricity industry is all out to make the public electric-light minded. The article in the *Evening Standard* is typical of what we mean. What is to be our reply? We should be much more satisfied if there were a distinct organization within the Industry, working in close co-operation with the manufacturers—who, incidentally, are equipped better than ever before to assist—and concentrating solely on lighting problems. An organization—it need not be heavily staffed, but it would need to have a competent staff under able control—to which the smaller undertakings could apply for help. In the absence of such an organization we do urge those undertakings in whose areas installations of inferior and out-of-date gas lighting exist to get busy, with the aid of the manufacturers of equipment, in improving the standard before it is too late.

## Pure Science

The impact of pure science on industry, said Mr. H. W. Cremer in a recent lecture to the Liverpool Section of the Society of Chemical Industry, began to be generally appreciated by the people of this country during the War. Subsequently, the power of science as an instrument in peace as well as in war became increasingly manifest to industrialists as a result of the work of the new research organizations which had come into being, and before long the industrial market was flooded with young men who called themselves—and were called by their teachers—chemists. Mr. Cremer went on to say, however, that it was not easy to detect any appreciable change in the stereotyped methods employed by those responsible for the teaching of pure science to these young people, the future work of whom was presumably to be of such value and consequence. There are many who think that, even to-day, there is still much to be desired in the results obtained, particularly in regard to the general outlook engendered in the typical individual by such methods.

The line of argument and the suggestions put forward by Mr. Cremer are of great interest to us, because we are sure that pure science will play an increasingly important part in the development of the Gas Industry. Our Industry—we have emphasized this on many occasions—is essentially one of chemical engineering. It requires the services of those trained in pure science as well as of those specially trained in applied science; it needs, we think, scientific as well as what may be termed technical men. Appreciation of our contention is, we believe, bound to grow as time goes on. Acceptance of the chemist in the Gas Industry was tardy. Even in the early years after the War the engineer frankly objected to the chemist and rather looked down upon his work. There was, in general, no spirit of co-operation between gas engineer and chemist, and the latter's suggestions for improvement in plant and processes met with scant attention and often open derision. At that time the lot of the chemist was a hard one and the treatment he received disheartening. Fortunately, this highly unsatisfactory state of affairs gradually changed and the spirit of co-operation made itself felt. It is the co-operation between chemist and engineer, and between both and the physicist and metallurgist, which alone has rendered possible the advances which have been achieved in the treatment of coal at gas-works and in the efficient utilization of gas in home and industry. In future there will be, or certainly should be, a still greater measure of co-operation between engineer, chemist, and physicist. The necessity for this joint working is, in fact, being realized in many directions; it is difficult to understand why this recognition has been so long in taking shape.

## The Problem of Training

Discussing training, Mr. Cremer says that chemistry and physics—and in this he shares our views—both in theory and practice are inseparable, and physics in the great majority of cases is wisely chosen as the subsidiary subject for an honours degree in chemistry. "The teacher of physics, however, frequently a mathematical physicist, remains largely an idealist in his attitude to-

wards his subject. He does not as a rule think in terms of practical problems. . . . In consequence, large numbers of embryo chemists grow up with an intense dislike of physics. . . . When it is realized that very probably it is with physical principles and with physical methods of measurement the chemist will be largely concerned in after life, it is easy to see what opportunities have been lost at the very outset of his career." Mr. Cremer asks whether it can truthfully be said that the average newly graduated chemistry student, or even the research student for that matter, is sent out into the world with anything like a clear appreciation of either his true position or his potentialities. He asks whether it is too much to hope that if a person desires to make and is fortunate enough to be able to make a training in pure science a prelude to an industrial career, he should be given at any rate a sense of awareness of the manner in which what may appear to him to be the more recondite matters dealt with in his course are becoming of ever-increasing importance in applying chemistry to industry. He also asks that teachers should bear in mind that the bulk of their students are intended for absorption by industry, and that if the student can be made to understand how the different subjects which comprise his course are likely to be of use to him, his interest and progress will be considerably greater than if the main justification in his eyes for studying these subjects is that one day he will be called upon to sit for an examination in them. This is of the greatest importance, and in this connection one of the happiest features of the Education Scheme of The Institution of Gas Engineers is that the underlying principle is to widen the knowledge of students and develop their critical faculties rather than to regard success in an examination as the one criterion of ability.

## Works Experience

In regard to works visits, the observations of Mr. Cremer are much to the point. Such visits undoubtedly form a valuable adjunct to a chemistry course, he remarks, but careful organization is necessary to ensure their utility. Preparation before the visit and lucid explanation during the visit are essential if the student is to derive knowledge and benefit thereby, and not merely be vaguely impressed by, to him, meaningless masses of uncomprehended plant. In this connection we would go much further than Mr. Cremer and suggest that, whether the course be pure or applied science, facilities should be afforded for the student, as part of his course, to gain a more intimate knowledge of working processes. In regard to applied science, the recommendations made in the course in Gas Engineering at Leeds University afford an admirable example in this respect. Students are encouraged in their summer vacations to spend their time gaining an insight into works practice, and co-operation of gas undertakings and undertakings of allied industries renders possible this most desirable experience.

There is one other matter dealt with by Mr. Cremer to which we would call attention. One of the primary duties of the chemist in industry is to write reports, and it is claimed by many of those for whom these reports are written that the latter are frequently lacking as regards both substance and method of presentation. They are obscure; they do not emphasize the main points; and so far as non-technical people are concerned they are apt to include terms which, although of every-day use in the laboratory, possess quite separate and distinct meanings to the lay mind. A factor which contributes to this is, in Mr. Cremer's opinion, that specialization in science tends to begin at too early an age. Too early specialization in science, as opposed to arts, subjects is attended by very real dangers. "A good school endeavours to educate its pupils to think clearly and to write cogently, and to this end an early classical education is not to be despised. The over-emphasis of science subjects at too early a stage may indeed prove to be distinctly harmful, and there is little doubt in many minds that much of the lamentable weakness of many university graduates in expressing themselves is directly attributable to this cause."

## Forthcoming Engagements

**Feb.**

4.—Midland Juniors.—Paper by W. N. Smirles, "Gas-Heated Hot Water Systems."
5.—Manchester Association.—Visit to Works of Walpamur, Darwen; Paper on "Painting and Maintenance of Structural Work."
6.—Scottish Western Juniors.—Annual Whist Drive and Dance.
6.—Scottish Eastern Juniors.—Visit to Dundee Gas-Works; Paper by D. Warden.
12.—London and Southern Juniors.—Paper by F. O. Hawes, "The Effects of Changes in Composition upon the Combustion of Town Gas."
13.—Scottish Western Juniors.—Debate Meeting.
17.—B.C.G.A.—Meeting of Executive Committee, 11.30 a.m.
18.—Junior Associations.—Visit to B.I.F., Birmingham.
20.—Western Juniors.—Meeting at Bath; Paper by F. G. Craxford, "The History and Development of Gas Fitting."
23-25.—B.G.F.—Joint Gas Conference at the B.I.F., Birmingham.
26.—I.G.E.—Gasholder Committee, 2.30 p.m.
27.—Scottish Junior Association.—Joint Meeting at Edinburgh; Paper by F. B. Holmes, "Scrubbers."

*(There will be no meeting of the Central Executive Board of the National Gas Council during the month of February.)*

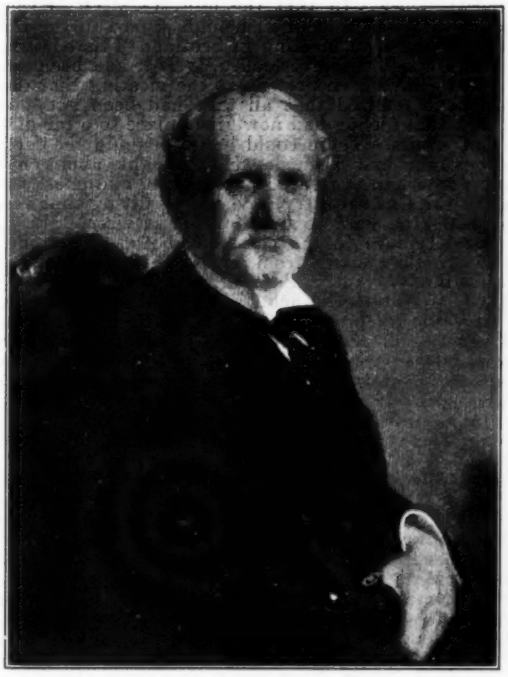
**March.**

3.—S.B.G.I.—Council Meeting, 2.30 p.m.
4.—Midland Juniors.—Paper by H. Wynne (Burton-on-Trent).
9.—N.G.C.—Central Executive Board Meeting, 2.30 p.m.
10.—London and Southern Juniors.—Visit to Teape & Co., Paper Mills, Dartford.
11.—Midland Association.—Annual General Meeting, Grand Hotel, Birmingham, 2.30 p.m.
13.—Scottish Western Juniors.—Visit to Glenboig Brickworks.

## 1937 "JOURNAL" DIRECTORY

Page 6. BASINGSTOKE. H. C. Higgs, M.D. & S., retired.
Page 18. COLNE. A. Nicholson appointed E. & M., vice F. Thorpe, deceased.
Page 20. CROOK. G. D. Cowie appointed M.
Page 20. DESBOROUGH. Now entitled "Desborough Gas Company, Ltd."
Page 22. EASTBOURNE. S. W. Hammond, E. & W.M.
Page 32 HERNE BAY. F. Dawson appointed E. & M., vice D. H. Davies, retired.
Page 56. ROTHWELL (LEEDS). L. Shaw, E. & M., retired.
Page 58. SALFORD. E. Crowther, E. & M., resigned.
Page 72. WATFORD. G. Wilks appointed G.M. & S.; T. C. Battersby, C.E.; W. Evetts, Watford, W.M.; H. C. Dunbar, St. Albans, W M.
Page 72. WELSHPOOL. Now entitled "Welshpool Gas Company, Ltd."
Page 80. AYTON. J. Martin appointed E. & M., vice G. D. Cowie, resigned.
Page 86. IRVINE. A. Walker appointed E. & M., vice J. R. Gentry, retired.
Page 86. KILBARCHAN. A. Walker, E. & M., resigned.

# FOR SERVICES TO THE GAS INDUSTRY IN SCOTLAND



The Portrait by Mr. Cowan Dobson, the Scottish Painter.

*The portrait has the following inscription: "J. W. Napier, Esq., presented by the National Gas Organisations (Scotland), in appreciation of services rendered as hon. secretary, 1919-35."*

## Mr. J. W. Napier Honoured

### Presentation of Portrait

Representatives of the Gas Industry from all parts of Scotland gathered at a luncheon in the North British Station Hotel, Edinburgh, on Jan. 27 to pay tribute to Mr. J. W. Napier, of Alloa, who has recently retired after many years' service as Hon. Secretary of the National Gas Organizations in Scotland. A portrait in oils was presented to him by Sir William Whyte. Mr. Maule Guthrie, of Brechin, presided.

Sir WILLIAM WHYTE said it was a real personal gratification to him to have been asked to be the medium for handing over to Mr. Napier, on behalf of the subscribers, his portrait in oils, and he thought they would agree that the artist had done his work well and had produced a striking likeness of their guest of that occasion.

Mr. Napier, like many of those associated with the Gas Industry, was born into it, said Sir William. His father was for the long period of 43 years a Gas Manager, and Mr. Napier himself had completed a period of 40 years as a Gas Engineer and Manager. They all sincerely hoped that he would beat the very commendable record of his father and retain for many years that energy and vitality which had characterized his whole career. Sir William had been delving into some of the historical matters relating to the Gas Industry in Scotland with which Mr. Napier had been associated, and he found—just as one expected of such a keen protagonist of the Industry—that he was always ready to recognize and acclaim the great work of pioneers whose names they had always in their minds—men like William Young and William Murdoch. Every Scottish Gas Engineer was familiar with the scientific work and the pioneer labours of William Young in the carbonization of coal in vertical retorts. Mr. Young died in 1907, and in the matter of a suitable memorial Mr. Napier took the initiative. A considerable sum of money was raised by subscription, and the result was the start of the famous "William Young Lectures," to be delivered by men eminent in industry and science. The brilliant series of lectures had added enormously to the value to the transactions of the North British Association, and Mr. Napier was to be remembered for his initiative and labours in this connection.

Another Memorial with which Mr. Napier was intimately connected was that of William Murdoch. In this case the Memorial took the form of a bronze tablet fixed upon the wall of the house where Murdoch was born at Bello Mill, Lugar. The proposal of Mr. Napier arose out of his visit to Lugar, when he discovered that the birthplace of "that incomparable mechanic" did not bear any tablet or mark of reference.

Mr. Napier was probably best known throughout Scotland as an adviser to a large number of Company and Municipal Gas Undertakings. In this connection Sir William's own memory went back to 1913-14, when the Lanarkshire Gas Scheme was first considered. The late Mr. George Hislop and Mr. Napier were called in by the County Council to advise a scheme of purchase and co-ordination of gas supply, and they presented a most comprehensive and exhaustive report. The war intervened, and certain changes were necessary, but this large scheme of amalgamation was finally carried out almost entirely on the lines of that report.

Mr. Napier had acted as expert adviser and witness in a large number of arbitrations in Scotland connected with the purchase of company gas-works by municipalities. Sir William understood that he had acted in all the arbitration cases in Scotland for fully twenty years past.

A matter of great practical value and financial benefit to gas undertakings was the agreement for the sale of tar and ammoniacal liquor between gas undertakings and distillers which continued for a period of ten years up till 1929. This scheme was followed by the present Co-operative Tar Scheme, which had been highly successful. In both schemes Mr. Napier took a large share of initiative and carried out the duties of Secretary.

### Honoured by His Profession.

Mr. Napier had been honoured by his professional brethren in the Industry in having occupied the positions of Chairman of the Informal Meeting of Scottish Gas Managers and as President of the North British Association of Gas Managers, and incidentally acted as President on one occasion of the Waverley Association of Gas Managers—this being an unusual record.

As Secretary in an honorary capacity to the various Scottish Gas Committees over the long period of twenty years he had earned the respect and the gratitude of Gas Engineers and Administrators throughout Scotland, and it was on account of his retirement from his Scottish appointments that his friends had taken the opportunity of recognizing his services that day. Mr. Napier had also contributed Papers from time to time to Gas Associations and to the Technical Press which had the stamp of real merit and value.

It would be of interest to many of them to know that Scotland had a Gas Organization of its own prior to the establishment of the National Gas Council. Mr. Napier was in great measure responsible for the setting up of the Scottish Gas Council which was ultimately associated with the National Gas Council of Great Britain and Ireland, but, like prudent Scots, they reserved to themselves the right to deal separately and independently of the National Gas Council so far as affairs of purely Scottish interest and concern demanded. Mr. Napier was one of the first two representatives appointed to the National Gas Council, and he had continued to act as one of the Scottish representatives since 1919.

There was one other thing that Sir William had to mention, and that was the recent appointment of a special officer to attend to the interests of the Gas Industry in Scotland. Mr. Napier took a leading part in that arrange-

ment, and he felt certain that the experiment would be justified to the full. Mr. Drummond had now entered upon his duties, and they all looked forward to a new era under his direction which would consolidate and strengthen the various gas interests throughout Scotland and make for their increased prosperity.

Mr. Napier was an enthusiast in his work, and they would agree that it was the enthusiasts who made a success of things. It was therefore with no small pleasure that Sir William had been permitted to take part in the proceedings that day to honour his friend and their friend and colleague, Mr. J. W. Napier—one of the stalwarts of a great public service—to whom on behalf of the subscribers and on behalf also of the Gas Industry as a whole he said: "We wish you many years of prosperity and happiness in the profession you have so long adorned."

Mr. S. MILNE, of Aberdeen, remarked that it was a privilege and honour to have this opportunity of expressing his admiration of the services Mr. Napier had rendered to the Gas Industry in Scotland. He was what might be termed a Scottish Nationalist—he had always stood up for the rights of Scotland in the Gas Industry. He actually dared at one time to suggest the changing of the name of the North British Association of Gas Managers in order more emphatically to declare itself—the Institution of Gas Engineers of Scotland. He had had differences with his colleagues. He had been thwarted in some of his schemes, but Mr. Milne had never known him take offence. It had always been a surprise to him how Mr. Napier got through so much work. Chaffingly he used to suggest that there could be no time left to look after the interests of Alloa. His response was: "A matter of organization." Probably, for his undertaking at Alloa was in a flourishing condition, and his works were such as any Engineer might be proud of.

His work in connection with the National Gas Council, British Commercial Gas Association, Federation and Regional Council had been arduous and exacting, necessitating the preparation of voluminous Minutes, profuse communications and correspondence, but always in perfect order, so that facts could be readily got at for reference. He was a man of vision, of broad outlook; one who took a statesman-like view of a situation—in short, an outstanding personality in the Industry. He knew of no one in the Industry who could have carried on the work so efficiently, and he knew of no one in the Industry to whom they owed more than to J. W. Napier, of Alloa. They thanked him most sincerely and trusted that he might long be spared in health and strength to encourage and stimulate the Gas Engineers of Scotland.

Mr. W. J. SMITH (Secretary of the N.G.C.), in thanking the representatives in Scotland for inviting him to be present at this function, referred to the services which had been rendered by Mr. Napier as Hon. Secretary of the Scottish Board of the National Gas Council, the Scottish Committee of the Federation of Gas Employers, and as Employers' Secretary of the Scottish Regional Council. Mr. Napier had been connected with the National Gas Council for twenty years, and had always loyally supported its work. In 1917 the late Mr. J. R. Hislop, of Paisley, who was held in such high regard in the Gas Industry, stated at a meeting in Scotland "that it was felt that they were being overlooked." If it had been possible for him to have been present at the meeting that day, he would have realized that all that had been swept away, and that that feeling had now given place to a far different state of affairs. There could be no denying the fact that this position had been largely brought about by Mr. Napier, who had spared no pains, time, and energy in the work of the Gas Industry, and it was fitting that recognition should be paid to him for his services. Mr. Smith also paid tribute to the close collaboration and help he had received personally from Mr. Napier for so many years.

Councillor W. Muter, Edinburgh, also spoke.

Mr. J. W. NAPIER, in acknowledgment, said that the Gas Industry for its progressive spirit alone in the principles and practice of treatment of coal, and in the sphere of advertising propaganda and sales of gas, was the envy of all other businesses where efficiency was a guarantee of success. He was proud of their National Gas Council, with its wise administrative zeal and powerful influence in legislation. The years of record of the working of the Council provided a foundation of security for the Industry as a public utility service and had given to gas as an investment a substantial place in the financial world. The results had been reached by the power of the individual—a factor of overwhelming influence always—and in this regard he coupled the names together with high respect and appreciation, of Sir David Milne-Watson and Col. S. S. Ogilvie. Nor must he omit to mention the name of one officer in particular of the National Gas Council, whose overflowing courtesy and high sense of duty had created for himself an affectionate regard by everyone. He referred, of course, to Mr. W. J. Smith, the General Secretary. He felt proud also of the British Commercial Gas Association with an advertising influence and a propaganda, the best of all industries, and the finest in the world. The Association was an organization built up from within, and from its own potentialities of finance and influence. That surely was the best and strongest. In the history of the Association's energies, he desired to mention two names, and he coupled them together, Sir Francis Goodenough and Mr. W. M. Mason.

Referring to the portrait, Mr. Napier said: "I shall always cherish it very deeply. It is something that will be a great joy to my family."

## Personal

Included in the list of New Year Honours conferred by the King are the names of Lord GREENWOOD, Chairman of Dorman, Long & Co., Ltd., who has been created a Viscount; Sir HARRY MCGOWAN, Chairman of Imperial Chemical Industries, Ltd., who has been made a Baron; and Mr. H. T. TIZARD, Rector of the Imperial College of Science and Technology, who has been awarded the K.C.B.

* * *

Mr. W. B. MCLUSKY, Engineer and Manager of the Halifax Corporation Gas Department, was recently the recipient of warm congratulations and good wishes from the Borough Gas Committee on reaching the completion of 25 years' service as head of the Halifax Undertaking.

* * *

Mr. L. GIBSON, who has served for four years as the representative of the Special Service Section of the Birkenhead Corporation Gas Department, has been appointed Fitting Superintendent and Showrooms Manager to the Bradford Gas Department. Mr. E. LONGBOTTOM, Manager of the Argyle Street Showrooms, Birkenhead, for five and a half years, is also leaving to take up the position of Showroom Manager at Chesterfield. On Friday, Jan. 29, the Birkenhead Corporation Gas Department staff presented Mr. Gibson with a gold watch and Mr. Longbottom with a tea wagon and smoker's stand. Mr. J. Hood, Gas Engineer and Manager, made the presentations.

* * *

Mr. ALAN NICHOLSON, son of Mr. M. Nicholson, of Stockton-on-Tees, has been appointed Engineer and Manager of the Colne Corporation Gas Department in succession to the late Mr. F. Thorpe. Mr. Nicholson received his training at the Stockton Corporation Gas-Works and afterwards joined Messrs. Ashmore, Benson, Pease, & Co., Ltd., as a draughtsman. For a time he was General Assistant at the Darlington Corporation Gas-Works and two years ago he went to Colne as Assistant Engineer.

## Obituary

For 46 years associated with the Hampton Court Gas Company, Mr. CHARLES SANDERS LAMB, died suddenly on Tuesday, Jan. 26, at the age of 66 years.

The son of the late Mr. W. Lamb, of Knight's Park, Kingston, Mr. C. S. Lamb was born in Kingston and as a boy was articled to the Hampton Court Gas Company. He eventually became Assistant Manager, but, owing to his gradual loss of sight, had to give up that position, although he was employed by the Company until his retirement at the end of 1933.

Mr. Lamb is survived by his wife and by three brothers. The late Mr. W. C. Lamb—a brother of the deceased—was for 46 years Secretary of the Hampton Court Gas Company. Mr. C. S. Lamb's nephew, Mr. M. C. Lamb, is the present Secretary of the Company.

The funeral took place at St. John's Church, and among those present were Mr. C. T. Price (Engineer and General Manager of the Hampton Court Gas Company), Messrs. H. J. Hodder and J. H. Johnson (Hampton Court Gas Company), and J. Pratt (representing George Glover & Co.).

# News in Brief

CURRENT EVENTS IN THE GAS INDUSTRY

**An Electricity Breakdown** which lasted for about an hour occurred in the Blackness district of Dundee on Jan. 25, about 30 houses being affected.

**H.R.H. The Duke of Gloucester** will visit the Engineering and Hardware Section of the British Industries Fair at Birmingham on Feb. 16, the day after it opens.

**Lists Were Opened** and closed last Friday morning for an issue by Messrs. Cochrane & Co., Annan, Ltd., of 490,904 ordinary shares of 5s. each at 6s. 3d. per share. It is understood that the issue was over-subscribed.

**Following the Granting of a Concession** for building Palestine's first gas-works at Tel Aviv, the Palestine Gas Installation Company has been formed with a capital of £1,000 to trade in goods and apparatus necessary for gas plants.

**An Entertainment of Talking Pictures** was given last week by the Newcastle-upon-Tyne and Gateshead Gas Company in the Power House, Hebburn. The programme included gas films of interest to housewives, as well as panoramic shots and novelty cartoons.

**The Price of Gas** at Youghal (Co. Cork) is to be reduced by 5d. to 5s. 5d. per 1,000 cu.ft., representing about £280 per annum. To meet a steadily increasing demand for gas the Engineer and Manager (Mr. M. J. White) recommends the provision of a new gasholder.

**According to the Monthly Reports** of the Stockton Corporation Gas Engineer (Mr. W. W. Atley), gas consumption during the past nine months shows an increase of 5·65% compared with last year. The production during the present financial year is expected to reach 738 million cu.ft.

**In the Liverpool Section** of the *Daily Mail* Duplicate Bridge Tournament the Engineer and Manager of the Ellesmere Port U.D.C. Gas Department (Mr. H. W. Dean) and his wife were the top scorers in the North and South positions. They are chosen to represent Liverpool in the final test in London in March next.

**It Was Decided** at a meeting of the Plymouth Corporation Gas Committee on Jan. 25, that consumers with slot meters be allowed to pay for enamel cookers through their meters, adjustments being made in the quantity of gas supplied for 1d. The Engineer was authorized to carry out Coronation celebration decorations at the showrooms in Fore Street, Devonport, and at the works.

**The Keighley Corporation Gas Committee** recommend, in connection with improvements at the gas-works, acceptance of the tender of Messrs. Clapham Bros., Ltd., of Keighley, for the supply and erection of a set of horizontal water-tube condensers and one horizontal rotary scrubber; and of Messrs. Clayton, Son, & Co., Ltd., of Leeds, for the renewal of guide framing of No. 1 gasholder.

**A New Issue** is announced by the South Suburban Gas Company of £200,000 of 3½% redeemable debenture stock, 1957, at par, together with £250,000 of 3¾% redeemable preference stock, 1967, at the same price, to rank *pari passu* with the existing debenture and preference stocks of the Company respectively. The lists will open on Thursday, Feb. 4, and will close on or before Friday, Feb. 5.

**In Connection With His Observations**, made in the course of the discussion on Mr. J. Grayston's Paper before the London and Southern District Junior Gas Association, published in the "JOURNAL" on Jan. 6, Mr. H. W. H. Butterfield (South Suburban) points out that it is not necessary to notify the owner of any adjoining lands unless there is a dwelling-house thereon within the 300 yd. stipulated.

**Approval Has Been Given** by the Public Utilities Committee of the Edinburgh Town Council for the reconstruction of the vertical retort installation at the Granton Gas-Works at a cost of £36,000. In the report from the Engineer and Manager it was stated that the plant had been in continuous use for nearly six years and had carbonized 750,000 tons of coal, but during the past winter quite a number of retorts had to be put out of use, because of leakage through the firebrick walls.

**At a Meeting** of the Aberdeen Gas Committee on Jan. 27 it was reported that the amount of gas made during December, 1936, was 194,167,000 cu.ft.—an increase of 181,000 cu.ft. compared with December, 1935—while 670 more tons of coke were sold. Revenue from coke was £5,772—an increase of £1,067—and from tar products and ammoniacal liquor £1,873, which was £97 less than for December, 1935.

**Fears Were Entertained** last Saturday for the safety of the gasholder which is situated between East Wemyss and Buckhaven. The wall and roadway fronting the gas-works were swept away by rough seas, which by night time were only a few yards from the holder; but fortunately the storm abated late that night, or the consequences might have been serious. The gas-works are the property of Buckhaven and Leven Gas Commissioners.

**Arrangements Have Been Made** for the Manchester Branch of the Women's Gas Council to visit the Ideal Home Exhibition at Olympia on April 12. This announcement accompanied an interesting handbook recently issued by the Manchester Corporation Gas Department containing a programme of forthcoming Home Service Exhibitions, Lecture Demonstrations on Gas Cookery, and Health Talks by Mr. T. Bowen Partington at various local centres.

**Shower Baths, Porcelain Sinks, and Wardrobes** have been provided by the Slough Gas and Coke Company for their employees in a new £1,000 messroom built recently at the works. Provision is made for the workmen to have their own food warmed, and the messroom will be open day and night, an attendant being in charge. The premises were designed by Mr. H. Wilkinson (Engineer and Manager of the Company), and built by Messrs. Street & Co., of Slough.

**A Programme of Sound Films** is to be shown by the Rochdale Corporation Gas Department in different parts of the town and district, and the first performance was given in the New Pioneers' Hall, Lord Street, on Jan. 20. The Mayor and Mayoress (Councillor C. Crowder, J.P., and Mrs. Crowder) were present, as also was Councillor A. Ashworth (Chairman of the Gas Committee). The programme was repeated in the Milnrow Conservative Club on the following day, and the Norden Liberal Club on the Friday. There were further performances last week.

**Extensions of Mains** are to be proceeded with by the Stoke-on-Trent Gas Committee at a total cost of £4,352, of which £1,610 is for 8-in. and £741 for 4-in. mains in High Street, Longton. The tenders of the Newport and South Wales Tube Company, Ltd., for the supply of steel tubes, and of the Lead Wool Company, Ltd., of Snodland, Kent, for the supply of a portable air compressor, have been accepted. Messrs. H. & T. Danks (Netherton), Ltd., of Netherton, Dudley, have secured the contract for the boiler house, pump room, boiler settings, &c., at the Etruria Gas-Works.

**The Renewal of the Contract**, which expires shortly, under which Messrs. James Nimmo & Co. supply the Glasgow Gas Department with 2 million cu.ft. of gas daily at 11d. per 1,000 cu.ft. was considered by the Glasgow Gas Committee on Jan. 29. It was moved and seconded that the contract be renewed at 6d. per 1,000 cu.ft.; but by the casting vote of the Chairman (Councillor Joseph Taylor, I.L.P.) it was agreed to take no action. The Committee agreed by seven votes to five to confer with Messrs. William Dixon, Ltd., Govan Ironworks, Glasgow, on the same subject.

**One Hundred and Fifty Fitters** on the staff of the City of Birmingham Gas Department attended on Jan. 21 a lecture in the new Conference Room which forms a part of the new Fittings Depôt at Lord Street. Dr. D. A. Winter (Radiation, Ltd.) gave an interesting talk on "The Adjustment of Gas Apparatus," which was followed by a discussion. Mr. A. W. Smith (General Manager) and Mr. W. D. Rowe (Manager of the B.C.G.A.) were present. Mr. Smith explained that the meeting was the first to be held in the new Conference Hall, and he hoped it would be the forerunner of many other successful functions, both educative and social.

## Amalgamation and Grouping

*Newcastle and South Shields.*

It is understood that a provisional agreement has been reached for the merging of the Newcastle-upon-Tyne and Gateshead Gas Company and the South Shields Gas Company, which will bring Tyneside's gas supply under one control. The agreement is subject to ratification by the shareholders of both companies and to the necessary statutory authority. Negotiations have been going on since August last year. The South Shields Gas Company, which supplies the area from South Shields to Hebburn, has been in existence since 1824. There are two modern gas-works—one at South Shields and the other at Jarrow—which are capable of supplying gas up to 300,000 cu.ft. an hour.

*South-Eastern Gas Corporation and Tenterden.*

The Directors of the South-Eastern Gas Corporation, Ltd., have sent an offer to the shareholders of the Tenterden and District Gas Company, Ltd., to acquire the whole of that Company's preference and ordinary shares. The offer is as follows:

For each ordinary share of £10 nominal value of the Tenterden and District Gas Company, Ltd.:

Either (*a*) £16 in cash.
or (*b*) 11½ ordinary shares of £1 each, credited as fully paid, of South-Eastern Gas Corporation, Ltd., *plus* 7s. 6d. in cash.

For each 5% preference share of £5 nominal value of the Tenterden and District Gas Company, Ltd.:

Either (*c*) £5 15s. in cash
or (*d*) 5 4½% redeemable cumulative preference shares (1970/80) of £1 each, credited as fully paid, of South-Eastern Gas Corporation, Ltd., *plus* 2s. 6d. in cash.

Cash at the rate of 28s. for each ordinary share will be paid in respect of any such shares which, on allotment at the rates aforesaid, would fall to be allotted in fractions.

If the offer is accepted by holders of less than 75% of the ordinary shares, the Corporation reserves the right to withdraw the offer. The shares offered will rank for dividend from Oct. 1, 1936. Dividends paid on the ordinary shares of the Corporation for the last three years have been at the rate of 6% per annum. The offer is also conditional upon the acceptance thereof not later than Feb. 8, 1937, and will be completed on March 1, 1937.

## Gas Company Dividends

### East Surrey.

The Directors of the East Surrey Gas Company have decided to recommend dividends on the preference and ordinary stock for the half-year ended Dec. 31, 1936, at the following rates per annum respectively: 6% on the cumulative preference; 4½% on the redeemable preference; 5½% on the preference "A"; and 6% on the ordinary "B" stock, all less income-tax.

### Newcastle-upon-Tyne.

The Directors of the Newcastle and Gateshead Gas Company have decided to recommend, subject to audit, the payment on Feb. 27 of final dividends for the year ended Dec. 31, 1936, as follows: £2%, less income-tax, on the preference stock, making 4% for the year; and £2 17s. 6d.%, less income-tax, on the ordinary stock, making £5 7s. 6d.% for the year.

## Home Production of Motor Spirit

### Dundee Lecture

The production of motor spirit in this country should be increased, urged Mr. W. G. H. Heggie, of the Dundee Gas Department, addressing the Dundee Institute of Engineers in the Technical College, Dundee, on Jan. 29.

Mr. Heggie said that 94·2% of the spirit used was imported, and home production accounted for 5·8% during 1935. Home production was increasing on account of the further employment of hydrogenation plant and more widely practised recovery at gas-works. But a great gap remained between figures for imported and home produced oils, and in a time of crisis every additional gallon would tell its tale.

In the coal carbonizing industries the economic position was so sound as to make it past understanding why great quantities of coal gas were being manufactured to-day without being treated for the recovery of oil as motor spirit. Gas-works had a marked influence on the country's output of benzole, because they not only derived benzole from tar, but also from gas.

Mr. Heggie described the crude benzole recovery installation at the Dundee Gas-Works, which was capable of recovering over 1,000 gallons per day.

## 1850-1937

### History in Trafalgar Square

This was the heading which appeared above a little news story in the very centre of the *Barbados Herald's* pictorial page at the time of the succession of King George VI. We are indebted to Mr. J. W. Brown, Engineer and General Manager of the Barbados Gas Company, Ltd., for a copy. The story runs as follows: "On dwarf columns cast from bronze taken off the ships captured at the battle of Trafalgar are erected four octagonal gas lamps in Trafalgar Square, London.

"On the gas lamp column standing in Trafalgar Square, Barbados (Little England), was hung the loud speaker from which issued the Proclamation of His Majesty King George VI.'s accession to the Throne.

"It is also interesting to note that gas lighting is chosen for the most important thoroughfares of London, the world's greatest metropolis. . . . Gas street lighting stands sentinel at the Bank of England, just as it does at our local City Banks—Royal Bank of Canada, Barclay's Bank (Dominion, Colonial, and Overseas), and the Canadian Bank of Commerce. Gas for street lighting has stood the test of time."

## Correspondence

### *Hop Drying*

SIR,—In your issue of Jan. 13 we have seen an article on hop drying by gas, by Mr. A. H. Bird. There is a statement therein to which we feel we must take strong exception.

As pioneers of the direct-fired oil firing system for hop drying, we have fitted up about 98% of the kilns so fired to date. Last season about 15,000 cwt. of hops were dried by our system, so that we think we are entitled to be regarded as the "experts" in it. The statement to which we take objection reads:

> "But in spite of the assurance of the advocates of these appliances, their use does involve risk of spoilage inseparable from certain characteristics of the products of oil combustion."

The proof that such risk does not, in fact, exist lies in the following:

1. 15,000 cwt. of hops were dried last season without any contamination whatsoever.
2. Not a single pound of hops dried by our system has hitherto been rejected by the Hops Marketing Board.
3. Whereas the insurance against contamination cost 10 guineas per kiln for 50% of the risk when our system was first introduced in the 1933 season, it is now £1 per kiln for 80% of the risk. This is an indicatoin of the view taken by Lloyds of the risk.
4. Many hundreds of bakers' ovens throughout the country are direct fired by our system. Shredded wheat is produced in Welwyn in ovens in which the biscuit itself passes within 18 in. of the flame of the burner. It is obvious that these operations could not be carried out if there was any risk of contamination whatever.
5. The fact is that the risk of contamination by other methods of drying is substantially greater than that when our system is used. Many hundreds of pockets of hops continue to be rejected annually by the Hops Marketing Board on account of arsenic contamination.

We trust you will give this explanation similar publicity to that cited above.

Yours, &c.
For KALOROIL BURNERS, LTD.,
R. WINTER.

*Hammond Works,*
*Victoria Road, N.W. 10,*
*Jan. 28, 1937.*

## South London Electricity Failure

### Many Areas Affected

A failure of the electricity supply, as a result of a slight fire at the Barking Power Station of the London Electricity Supply Company, caused considerable inconvenience throughout many districts in south-east and south-west London and also in West Kent at about 11 p.m. on Tuesday of last week.

Many streets and houses without the advantages of gas-lighting were thrown into darkness in Putney, Lambeth, Streatham, Norwood, Dulwich, Tulse Hill, Croydon, Farnborough, Sidcup, Petts Wood, and Orpington. According to various reports, electric trains and tramcars were also brought to a standstill.

In the Kent area the current was restored within a few minutes by switching over to the grid supply, but in other districts, it is understood, electricity was not available again until about midnight.

## Scottish Junior Gas Association (Western District)

### Visit to Port Glasgow Gas-Works

On Saturday, Jan. 23, the Scottish Junior Gas Association (Western District) visited Port Glasgow Gas-Works. The visitors were welcomed by Mr. A. M'G. Clark (Engineer and Manager). At the conclusion of the inspection of the works the party was conveyed to the shipyard of Messrs. Ferguson Brothers, where the members witnessed a demonstration of a Hancock oxy-coal gas cutting and profiling machine cutting out the gudgeon for a ship's rudder. This was cut from a solid block of steel 8 in. thick, the shape being obtained by means of an electric tracer operating on a template. An interesting feature was the carburetting of the coal gas due to the low calorific value. The town gas is bubbled through benzole to give it the required calorific value and 1·5 gallons are used per 1,000 cu.ft.

The visitors then adjourned to the Town Hall, inspecting *en route* the showrooms, where the Provost and Magistrates welcomed those present. The Provost said he hoped all present had enjoyed the visit to their works that afternoon, and, although most of the members came from larger undertakings he trusted that they had seen something to interest them in such a comparatively small works. The works were built just after the war when costs were at their peak, and this, unfortunately, was still reflected in the selling price of gas; he believed, however, that their manufacturing costs compared favourably with much larger undertakings in Scotland. He had been informed that there were two old-established Junior Gas Associations in Scotland, and as their Manager had been President of the Eastern District eleven years ago and Mr. Webster was now President of the Western District, Port Glasgow would appear to share the honour with Dundee of having had a President of each Association as Manager and Assistant, so that the old saying that "East is East and West is West and never the twain shall meet" did not seem to hold good so far as the Gas Industry was concerned. He would again like to say how pleased they had been to have had the Juniors present that afternoon.

Mr. Clark said that they had had a stiff uphill fight against ever-increasing taxation, &c., but, nevertheless, the cost of gas into the holders during the last ten years had not varied by more than 2d. per 1,000 cu.ft., the average cost being 11·25d. per 1,000 cu.ft. Within that period £53,000 had been handed over for the relief of the rates, the price had been reduced from 6s. to 4s. 6d. per 1,000 cu.ft., and he hoped that it would be still further reduced in the near future. In spite of the depression which hung over Port Glasgow the output had shown a steady increase, and the new housing scheme policy of the Council would help it still more. Remarking on the sales policy of his Undertaking, Mr. Clark said that the P.T.M. system had been the salvation of Port Glasgow.

Mr. J. Webster (the President) thanked the Provost and Council for the invitation extended to the Association and for the hospitality so generously provided.

Bailie J. S. Crighton (Convener of the Gas Department) associated himself with the Provost in welcoming the Association to Port Glasgow and expressed the hope that they had all spent a profitable afternoon. One feature of interest to all had been the demonstration of steel cutting in Messrs. Ferguson's shipyard, and he would like to take this opportunity of thanking Messrs. Ferguson for the privilege of seeing a process which had certainly revolutionized a very important part of their work. He hoped that Messrs. Ferguson's enterprise in putting down this up-to-date machine would enable them to secure further orders for Port Glasgow.

Mr. R. A. McLaren (Newton-on-Ayr), Vice-President, thanked the guides for the admirable way in which the party had been conducted round the works that afternoon, and after tea the members were entertained to a ciné-camera show which was enjoyed by everyone present.

## Pension Plan for 21,000 Employees

### "Legal and General" Scheme for United Steel Companies

What must be the largest single Group Life and Pensions Policy ever issued in this country was signed at a dinner given by the Legal and General Assurance Society to the officials and works representatives of the United Steel Companies at Sheffield recently.

Of the eligible employees 90% joined the scheme at its inception, which was strongly recommended to the men by their trade unions and works councils. Much credit is due to these bodies for their assistance in bringing the scheme to fruition. The total sum assured amounts to £1,700,000.

The Chairman of the Society, Mr. Ernest E. Bird (who is also a Director of the Croydon Gas Company), in proposing the Toast of "The United Steel Companies," said he felt certain that in the years to come, when the men went to draw their pensions, they would bless those in control—the management, the trade union officials, the managers, and all those who had helped to bring the scheme to a successful conclusion. He was glad the scheme was one of co-operation between employers and employed. No scheme was good unless all those interested contributed to it.

Sir Walter Benton Jones, Bart. (Chairman of the United Steels), responding, mentioned the varied interests of the Combine. He was glad to be the Chairman of a Company which had been bold enough to undertake the liability of a pension scheme open to all employees. It was not an act of benevolence. Those engaged in the management of the Combine were very much concerned with the welfare of all who worked in it.

Mr. W. A. Workman (General Manager of the Legal and General), in proposing the success of the scheme, said that in its initial stages it gave rise to a good deal of suspicion in certain quarters. He appreciated the fact that there was bound to be suspicion on the part of some people who thought the whole thing was a "plant" to get something out of them without there being much adequate return. The negotiations for the scheme began in April, 1935, and the first part embraced 1,500 employees only. Subsequently other batches were brought in until, finally, a scheme was devised which covered the whole of the workpeople of the vast Combine. Now membership of the scheme was a condition of employment, so that as time went on there would be 100% membership. That would ensure that every employed person was safeguarded for his old age and in the event of early death.

In the course of his remarks, Capt. Hilton (Managing Director of the United Steels) said that if there had not been that confidence they tried to encourage between the men and the management, the suspicion which a proposal like that was bound to raise might have caused the abandonment of the scheme altogether.

After the policies were signed by Mr. Bird and Mr. Workman, the gold pens used by them were handed to the Chairman and to the Managing Director of the Combine.

For some years past the Legal and General has specialized in group life and pension schemes, and the number now on the books shows how successful it has been in devising and selling "block" insurances of this type. A special department handles the present very large volume of new business and the acquisition of the United Steels scheme demonstrates that the Legal and General possesses a highly skilled administration capable of servicing the largest and most difficult problems set before them.

## Municipal Year Book

### 1937 Edition*

The 1937 edition of this standard work of reference has been published fully two months earlier than previous editions. This has necessitated certain re-arrangement of the volume, and the changes have been accomplished without the sacrifice of material which has ensured the utility of the book in the past.

The new edition consists of 50 different sections, 41 of which deal with every important phase of the civic adminis-

* The Municipal Year Book and Encyclopædia of Local Government Administration. The Municipal Journal, Ltd., 3 and 4, Clement's Inn, Strand, London, W.C. 2; 30s. net.

tration, the remaining nine sections comprising the directory of National Departments of State, Municipal Corporations, County Councils in England and Wales, London Government, Urban and Rural District Councils, Local Government in Scotland and in Ireland, and Joint Authorities in Great Britain. There are 1,676 pages, 32 more than in the 1936 issue, and the present edition constitutes a record since the Year Book was founded in 1897.

Two Cabinet Ministers are responsible for forewords. Sir Kingsley Wood, Minister of Health, contributes a preface in which he emphasizes the need for physical improvement of the people. "The time has come," he writes, "to set up as our objective more definitely than before the task of making available to each individual the means of developing and maintaining a strong and disease-resisting physique." The Minister of Transport, Mr. Hore-Belisha, in a foreword to the Roads and Transport Section, calls for more rapid progress in the policy of installing traffic lights, beacon crossings, and pedestrian guard rails.

Fifty pages of the new edition are devoted to a succinct survey of the outstanding developments in Local Government in 1936. There is a comprehensive review of latest local government legislation, followed by a digest of leading law cases in 1936. Statistical tables attached to many of the sections give the latest figures relating to Local Government services, and these are indispensable for comparative purposes. In the Directory part of the book the descriptive material relating to local authorities has been revised and brought up-to-date. Fully 80% of the volume has been re-written.

## Making Provision for the Old Employee

### National Savings Provident Scheme

One of the problems confronting every employer is that of the employee who has grown old in the service of the firm. For the employee, too, provision for old age and for dependants is a matter that may wake anxious thoughts, and all wise employers realize the importance of helping those they employ so to order their affairs that financial worries and anxieties are, as far as possible, minimized.

Most of the large business organizations in the country have, for that reason, set up Provident Schemes of one kind or another for the benefit of the workers engaged in their undertakings. Employers operating on a smaller scale frequently find, however, that they cannot carry the large obligations those schemes involve. Such employers may now be well able to meet their requirements by invoking the assistance of the National Savings Committee, which has a variety of schemes to suit differing needs.

The Committee's National Savings Provident Scheme is one that calls for special attention. It has a flexibility that enables it to be adjusted to the demands of any individual firm, whether large or small, and it can be so applied as to offer one or both of the two following benefits—endowment provision for a member on retirement, and provision for his dependants should a member die while still in the service of the firm.

Another useful facility offered by the Committee is the National Savings Club Scheme. This has been specially designed to offer a good sound basis of management for Christmas clubs, holiday clubs, and all the other kinds of share-out clubs by means of which so many people employed in business put a bit of money aside through the course of the year.

## Incorporated Accountants' Year Book*

### 1937 Edition

The Society of Incorporated Accountants has published the Incorporated Accountants' Year Book for 1937, being the 50th Volume of the series. The book is bound in blue cloth, and extends to 1,248 pages.

The Year Book comprises a list of members, arranged alphabetically and topographically, together with the Articles of the Society, regulations for admission to the Examinations, and full information concerning the Society's activities. The names of firms in which Incorporated Accountants are partners are given alphabetically and under each city or town. The book contains the names of 6,908 members, of whom 5,755 are in England and Wales, 134 in Scotland, 181 in Ireland, and 838 in the British Dominions, Colonies, and foreign countries. The Society has 31 branches and district societies in the leading cities and towns of Great Britain, Northern Ireland, the Irish Free State, and throughout the British Dominions. Particulars are furnished of the work and resources of the Incorporated Accountants' Benevolent Fund and of the facilities afforded at Incorporated Accountants' Hall for Meetings.

* The Society of Incorporated Accountants and Auditors, Incorporated Accountants' Hall, Victoria Embankment, W.C. 2.

## Western Junior Gas Association

### Visit to Swindon

A Meeting of the Association was held at Swindon on Saturday, Jan. 23. One party inspected the gas-works, while another party proceeded to the Co-operative Bakery Department, where they inspected a battery of gas-fired ovens used for bread and fancy pastry baking. The other equipment included dough kneading machinery heated by gas.

After this the Printing Works of the Local and County Newspaper were visited. Here type metal melting plant, gas heated, was seen and also a new gas heated central heating plant.

The two parties met again at tea, which was provided in the Demonstration Room of the Swindon United Gas Company.

Major WRIGHT, Chairman of the Company, welcomed the Association to Swindon.

The PRESIDENT (Mr. S. B. Jones, Clevedon) thanked Major Wright.

Mr. J. KAY (Bath) proposed a vote of thanks to the Swindon United Gas Company for the excellent hospitality and to the General Manager, Mr. C. H. Chester, for the splendid arrangements made for the meeting.

Mr. A. B. HORSFIELD supported the vote of thanks.

Major WRIGHT replied and was supported in his remarks by Mr. CHESTER.

## Village of Darkness

### The Electricity Cable which Never Arrived

An unusual situation has arisen at West Wemyss, Fife, which has been without street lighting for almost a year.

Last summer the local District Council sold the gas street lamps after deciding to install electric light, and about two months ago the Fife Electric Power Company deposited fully a mile of cable in the village with a view to connecting it up with their supply. Owing to a hitch, however, the cable was never laid, and it has now been removed to Largo to complete other work which the company have on hand.

Several villagers who have had their houses wired in readiness for installing electricity are at present obliged to use paraffin lamps for illumination purposes. Electric torches and pit lamps are being used to assist pedestrians to find their way through the streets.

## Modern Fixing Practice

### Free Offer of a New Publication

The Rawlplug Company, Ltd., has performed an exceedingly useful service by publishing a technical handbook dedicated to "all who are engaged in handling fixing problems." The Gas Industry is, of course, continuously engaged on such problems, and "Modern Fixing Practice" will help towards neat and safe fitting work. The book is divided into sections dealing with various trades and professions, and each section has been compiled by an authoritative writer. The section dealing with the Gas Industry—and it may be mentioned that the Gas Industry was among the first of the large industries in this country to realize the many uses to which Rawlplugs could with advantage be put—is compiled by Mr. R. N. LeFevre, Officer in Charge of Training, Gas Light and Coke Company, and his method of treating the subject is admirable. The section is extremely well illustrated by clear line diagrams, and representative examples of the use of Rawlplugs in the installation of gas equipment are set out.

"Modern Fixing Practice" is a technical publication thoroughly to be recommended. The book is priced at 3s. 6d.; but if any of our readers apply to the Rawlplug Company, Ltd., either mentioning the "JOURNAL" or on official letter-heading or business card the Company are prepared to forward a copy free of charge. The Company's address is: Rawlplug House, Cromwell Road, London, S.W. 7.

# BIRMINGHAM GAS DEPARTMENT'S

## New Branch Showrooms

AT

# Northfield

**Attractive new branch showrooms for the Birmingham Gas Department in their Northfield district were officially opened by the Lord Mayor of Birmingham (Alderman Harold Roberts) on Monday, Jan. 25.**

The rapid increase in the population of Northfield and district consequent upon the accelerated building activities of post-war years and the increasing popularity of gas for cooking, heating, water heating, and other domestic services, rendered the erection of this showroom and fitting depôt essential for the convenience of gas consumers.

This step is also in pursuance of the Birmingham Gas Department's policy of de-centralizing such of its services as will facilitate the prompt and efficient attention which is its aim. The transference of a staff of gasfitters to the depôt, and its proximity to the main thoroughfare and transport routes to the adjoining districts, will be beneficial, both to the gas consumers in the area served and to the Gas Department.

The external appearance of the new premises is dignified and pleasing, and care has been taken that the design shall be one with which other buildings to be erected on adjoining ground at some future time may readily harmonize.

The showroom occupies a corner site with two large display windows flanking the entrance. The front of the ground floor is occupied by a spacious showroom panelled in white mahogany and walnut, with a service counter for general enquiries, payment of accounts, &c. Immediately behind are the offices, fitting stores, fitters' messroom, workshop, garage, covered yard and—at a lower level—boiler house. The whole of the building is warmed by a gas-fired central heating boiler.

The upper floor includes an excellently appointed demonstration room, corresponding in size to the show room, and having a seating capacity of about one hundred. A selection of gas appliances is also displayed in this room. Adjoining the demonstration room are the demonstrator's kitchen, staff messroom, and a bulk store for fittings, which can be entered by a stairway from the main fitting store on the ground floor.

The ventilation of the premises has received careful attention, a mechanically-driven fan being fitted to assist in the extraction of vitiated air by means of ducts in the ceilings and walls.

Cookery demonstrations are to be given in the new building every Tuesday afternoon, while a qualified cookery demonstrator will be in attendance at the showroom every Friday afternoon to give help and advice on any question affecting the use of gas in the home.

## THE OPENING CEREMONY.

Councillor A. S. GILES, M.C. (Chairman of the Gas Committee), in thanking the Lord Mayor and Lady Mayoress for so kindly officiating at that ceremony, observed that some time had elapsed since the Gas Committee decided that, in order to give the best possible service to the Department's consumers, de-centralization of the fittings side of the business of the Undertaking should take place, and as far as possible branch showrooms and depôts should be established in various districts of the area of supply. With the opening of the new Northfield building, eleven showrooms and depôts had now been established, and he was pleased to say that they have more than justified their erection.

The power to supply the parish of Northfield with gas, went on Councillor Giles, was given in the 1864 Act of Parliament of the old Birmingham and Staffordshire Gas Light Company, which Undertaking the Birmingham Corporation acquired in 1875. The first supply of gas, however, to the district was not given until the year 1880, when the Department laid a main through the village to Rubery.

It was only a few years ago that Northfield was a very rural area, but with the widening of Bristol Road, the extension of the activities of the Austin Motor Company and Messrs. Cadbury Brothers, Ltd., and the establishment of other factories in the neighbourhood, housing estates (both Municipal and by private enterprise) had sprung up, and the population to-day was practically five times that of 60 years ago. This growth, together with the fact that the Department, by its 1935 Order in Parliament, extended its limits of supply to include the Parish of Crofton Hackett, caused the Gas Committee to decide that the time had arrived to erect a showroom and depôt in the district.

This new depôt extended its activities over approximately 9 square miles, and for the present would deal with about 11,000 consumers—*i.e.*, 7,000 prepayment and 4,000 ordinary consumers. The number of consumers was bound to increase with the further development of the neighbourhood which was taking place, but the new premises had been so designed that they would provide for the inhabitants' requirements for a number of years to come.

The largest consumer of gas in the Northfield area was the Austin Motor Company, which consumed approximately 177 million cu.ft. per annum. This was equal to the yearly consumption of over 5,000 Northfield consumers. During the war, the Birmingham Gas Department were called upon to lay a special main of large size to the Austin factory to supply the necessary gas in connection with the manufacture of munitions. At the present time, the Gas Department were laying a trunk main to the new aeroplane factory of the Company in Low Hill Lane. This scheme would involve an expenditure of approximately £30,000.

Before calling upon the Lord Mayor to declare the showrooms open, Councillor Giles, on behalf of the Gas Committee, presented him with a silver cigarette box as a memento of the occasion, with the hope that he would accept it, with all good wishes, and that his term of office as Chief Magistrate of the city would be a happy one.

In declaring the new premises open, the LORD MAYOR OF BIRMINGHAM remarked that these showrooms were an indication of the Gas Committee's desire to render the fullest service to the consumers of gas throughout its area of supply. The Birmingham Undertaking, he said, was the second largest in the country and was the biggest municipally-owned gas undertaking in the world. Notwithstanding the growth of the Electric Supply Department, the Gas Undertaking continued to flourish.

# THE ACCOUNTS OF
# The South Metropolitan Gas Company

**An analysis of the Accounts presented to the shareholders at to-day's Annual General Meeting. Sales of gas, number of consumers, and appliances on hire-purchase, show increases. The ordinary dividend, as already announced, is reduced by ¼% to 5½%.**

The quantity of gas sold in 1936 shows a net increase of 0·48%, but the gas sold to the South Suburban Gas Company in bulk accounts for 2,900,899 therms against 1,615,983 therms in 1935. The sale in the Company's area of supply was less by 885,968 therms, or 1·1%. The number of consumers has increased by more than 1,000, and the sales of apparatus on hire-purchase are more by 80%. The whole of the street lighting in the part of Wandsworth supplied by the Company and in the greater part of Lambeth has been secured, and the "Supervia" directional system will be used.

The Bill promoted by the Company in 1936 received the Royal Assent in July and authorized a therm-recording meter. The basic price and dividend fixed in 1920 will also be continued for five more years under this Act.

In September a new tariff was introduced and later withdrawn, and the powers of regulating charges possessed by basic price companies are now under consideration by a Joint Select Committee. The tariff was in operation from Sept. 10 to Oct. 16, and any consumer who paid more under the tariff than he would have paid at 8¾d. per therm has had the excess refunded, but since Oct. 16 the price has been 9d. per therm—an increase of ¼d. The Directors explain that this increase is to meet the increased cost of coal, materials, and labour.

The dividend proposed is 5½%—a decrease of ¼%—and it is to be paid after drawing £30,000 from Special Purposes Fund to meet "abnormal and unforeseeable expenses." It must be assumed that these expenses are in part the refund to consumers referred to above, in part the cost of altering the highly mechanized system of billing now used by large gas companies, and in part the cost of altering slot meters.

The Co-partnership Scheme is now in its 48th year, and one aspect of its benefits is shown by the low figure of 2·34% loss of time through sickness.

An auditor, Mr. J. H. Fry, has died during the year, and Mr. F. J. Bradfield, F.C.I.S., submits himself for the vacancy.

The vacancy on the Board of Directors caused by the death of Mr. Frederick McLeod has been filled by the election of Mr. A. B. Passmore.

Capital expenditure during 1936 has been £31,314 on buildings, plant, and machinery (against £6,869 in 1935), £99,220 on mains and columns (against £28,643), £7,111 on meters (against £7,754), and £96,399 on stoves and fires (against £20,600), making a total of £234,044 (against £63,866). No capital has been raised and the balance unspent is £4,370.

The big increase in capital expenditure is probably due to the increased cost of modern apparatus, the increased demand for enamelled cookers and coloured fires, and the cost of high-pressure and other street lighting installations.

Although since Oct. 16 the price of gas has been 9d. against 8¾d. for 1935, the receipts for gas are less by £30,123 for an increased quantity. The reason must be the reduction in domestic sales at the full price, and the revenue lost during the operation of the tariff. Payments by consumers in excess of 8¾d. per therm were repaid, but sales at less than this figure have been charged at tariff rates, perhaps as low as 4d. per therm.

Rentals are up by £16,246, £3,475 from meters, £13,517 from stoves, and fittings received £746 less.

Expenditure after deducting residual receipts was more by £23,541.

The following table summarizes the revenue account:

*Receipts.*

| — | 1936. | 1935. |
|---|---|---|
| | £ | £ |
| Gas (*less* public lighting expenses) | 2,720,645 | 2,750,768 |
| Rentals | 445,937 | 429,691 |
| Rents and transfer fees | 7,146 | 6,432 |
| | £3,173,728 | £3,186,891 |

*Expenditure.*

| — | 1936. | 1935. |
|---|---|---|
| | £ | £ |
| Coal (*less* residuals) | 385,583 | 376,993 |
| Wages (carbonizing) | 173,272 | 171,134 |
| Purification | 57,239 | 55,100 |
| Salaries of engineers, &c. | 76,015 | 79,471 |
| Repair and maintenance of works and plant | 441,884 | 444,302 |
| Total net manufacture | £1,133,993 | £1,127,000 |
| Distribution | 1,001,292 | 968,219 |
| Co-partnership | 33,550 | 50,324 |
| Rent, rates, and taxes | 121,867 | 136,843 |
| Management | 194,963 | 182,139 |
| Miscellaneous, including superannuation fund (£58,220), Co-partnership insurance fund (£88,489) | 178,135 | 175,734 |
| Total expenditure (*less* residuals) | £2,663,800 | £2,640,259 |
| Balance to net revenue | 509,928 | 546,632 |
| Dividend and interest (*less* interest and dividends received) | 539,035 | 546,953 |
| Balance (deficit) | £ 29,107 | £ 321 |

Coal carbonized was 1,111,395 tons, or 5,993 tons more, the increased cost being £64,355, and the cost per ton 20s. 5·58d. against 19s. 4·55d.

By-products receipts were more by £55,766 at £751,638. Each item fetched more except breeze. Coke made for sale was more at 513,762 tons against 510,816 tons, and the price averaged 22s. 7·90d. against 21s. 0·97d. No doubt the increased sales of Metro-Coalite helped to raise the average. Tar and ammonia have each improved.

*Residual Receipts.*

| — | 1936. | 1935. |
|---|---|---|
| | £ | £ |
| Coke | 582,046 | 538,414 |
| Breeze | 10,297 | 10,313 |
| Tar | 142,522 | 138,405 |
| Ammonia | 16,773 | 8,740 |
| Total | £751,638 | £695,872 |

Net coals are more by £8,590 and wages by £2,138, but salaries show a saving of £3,456, and repairs to works are less by £2,418. Purification costs have risen by £2,139, and the net cost of manufacture is more by £6,993. The cost into gasholder is 3·29d. per therm sold against 3·29d. in 1935 and 3·42d. in 1934.

Distribution charges are £33,073 more, and are approaching in magnitude the net cost of manufacture. Salaries were £14,289 more, mains and services £3,760 more, meters £55,633 more, stoves and fires £35,126 less, and fittings £5,483 less. The large increase for meters is perhaps accounted for by two alterations in slot rates in one year.

Co-partnership is less by £16,775, equal to the ¼% reduction in dividend.

Rents, rates, and taxes are less by £14,976, and the Directors' Report states that the valuation for the current quinquennium has been agreed without recourse to Quarter Sessions. Management is £12,824 more, and miscellaneous charges are up by £2,401.

Balance to net revenue is less by £36,704 at £509,928, and dividend and interest requirements are less by £7,918, partly due to the smaller dividend proposed. The sum of £30,000 is taken from Special Purposes Fund, so that the balance carried forward will be slightly increased.

The year's working shows the increasing cost of coal, labour, and materials. Distribution, or "service," charges are increasing, and income has fallen except from residuals. The year has seen, however, abnormal and, it is to be hoped, non-recurring expenditure on the tariff.

To balance the accounts, the shareholders receive £16,775

less, co-partners receive £16,775 less, and £30,000 has been taken from Special Purposes Fund.

The increase of ¼d. per therm if applied to all the gas would be equal in a full year to about £83,000.

Reserve, Special Purposes, and Renewal (leasehold) Funds have all been credited with full interest. The Funds now total £556,347.

The balance-sheet shows cash £40,177, investments £412,194, and bank loan £400,000.

The amount due under hire-purchase agreements has risen from £195,751 to £306,506.

Gas made and sold is shown below:

| — | 1936. | 1935. |
|---|---|---|
| | Therms. | Therms. |
| Quantity made and bought | 83,560 938 | 83,189,366 |
| Quantity charged | 80,136,935 | 79,749.589 |
| Correction for temperature and pressure | 2,526,562 | 2,514.960 |
| Total sold | 82,663,497 | 82,264.549 |
| Used on works | 1,406,667 | 1,398,159 |
| Quantity accounted for | 84,070,164 | 83,662,708 |
| Quantity not accounted for | 509,226 (0·61%) | 473.342 (0·57%) |

For the third year in succession this Company must be the envy of many others, for the gas sold and used on works is over ½% more than the gas made and bought.

The following principal working results and costs show that technical efficiency is still very high.

| | 1936. | 1935. |
|---|---|---|
| Coal cost per ton | 20s. 5·88d. | 19s. 4·55d. |
| Therms made per ton of coal carbonized | 75·07 | 75·06 |
| Coke made for sale per ton of coal carbonized, cwt. | 9·27 | 9·24 |
| Tar made for sale per ton of coal carbonized, gallons | 10·75 | 10·63 |
| | s. d. | s. d. |
| Prices realized— | | |
| Coke per ton | 22 7·90 | 21 0·97 |
| Tar per gallon | 0 2·86 | 0 2·82 |
| Liquor per butt | 0 9·54 | 0 5·04 |
| | Per Therm Sold. d. | Per Therm Sold. d. |
| Expenditure (*less* residuals) | 7·73 | 7·70 |
| Gas rentals, &c. | 9·21 | 9·29 |
| Balance, being profit | 1·48 | 1·59 |
| Dividend and interest | 1·56 | 1·59 |
| Balance (deficit) | 0·08 | .. |

## TESTING AND SERVICING

# The Gas-Operated Refrigerator

*L. W. ANDREW, B.A., of Watson House, describes the Gas Light and Coke Company's methods.*

Papers on the testing and servicing of refrigerators drew a large attendance to a meeting of the British Association of Refrigeration, in the hall of the Institute of Marine Engineers, Minories, E.C. 3, on Tuesday, Jan. 19—Dr. EZER GRIFFITHS, F.R.S. (President of the Association), in the chair.

A Paper was contributed by Mr. L. W. Andrew, B.A., B.Sc., of the Gas Light and Coke Company, who is concerned with the section at Watson House devoted to space heating and refrigeration. He pointed out that the Company had sold many thousands of gas refrigerators last year and had accepted responsibility for each one of them for five years. Such confidence was based partly on the experience of past years and on technical knowledge and control and close co-operation between Watson House and the manufacturers.

The subject divided itself naturally into three parts—testing by the manufacturer, testing by the Gas Company, and servicing by the Gas Company. But they were all inter-dependent. The Author emphasized that the useful life of the refrigerator should be no less than that of other domestic appliances of a related character, where, in general, changes by the user were dictated by progress in design, and must definitely be longer than five years.

Discussing testing by the manufacturer, Mr. Andrew said that the design of the refrigerating unit was so simple that testing was easy and certain. By means of control of the raw materials used, the soundness of welded joints and a performance test on each unit, consistent performance was assured. Owing to the absence of moving parts, with associated wear and tear, the life of a gas refrigerator—provided that it left the works correct—should be that of the cabinet and not that of the unit itself.

It was of first importance that all the internal surfaces should start clean and that there should be no trouble caused by internal corrosion after prolonged use. Materials were obtained from a limited number of suppliers working to specifications, and the works laboratory checked material daily from the different parts of the works during the manufacturing process and from the stores as each batch of material was delivered. The steel tubes and vessels were checked for freedom from pickling residues, after sand-blasting, by external examination, and by blowing steam through them. The hydrogen used in the system was tested to be at least 99% pure and free from oxygen and carbon dioxide, while the ammonia was synthetic and was tested for freedom from organic impurity. The water was distilled under supervision by the works chemist and tested to be free from metals, chlorides, and sulphates, and with a carbon dioxide content not exceeding four milligrams per litre.

The welded refrigerating unit, on its jig, was pressure tested to about three times the maximum working pressure and subjected to three consecutive tightness tests. Each joint was tested, and any parts not obviously accessible were pressure tested before welding to the main unit.

For performance testing, each unit in the assembled cabinet was given a 24-hour continuous test under conditions equivalent to operation in a hot room at 110° F. That condition was obtained at lower air temperatures by restricting the normal air circulation over the cooling fins. During test, the cabinets were loaded internally to a heat input of 102 B.Th.U. per hour for a 4 cu.ft. model, and *pro rata* for the other sizes; 10% of each day's manufacture was check tested in a hot room at 110° F. Cabinets which passed the required standards but represented the minimum performance of each day's manufacture were subjected to a special test.

The component parts of the gas equipment, such as the tubing and threads, were in accordance with B.S.I. specification and, therefore, with modern gas practice. The governor and injector used were checked individually to give an accuracy of maximum gas rate of plus or minus 5%. The gas burner assembly was tested on each cabinet for soundness by the pressure-drop method when holding a pressure of 30-in. w.g. The components of the actual cabinet, the paint, the rubber gaskets, the vitreous enamelling, &c., were all tested, and particular importance was attached to the final inspection of the finish of the cabinet under a daylight lamp. The Author emphasized that the testing and development work represented an interchange of ideas and a pooling of knowledge of three countries.

Coming to the testing by the Gas Company, Mr. Andrew said that a refrigerator, in common with any other appliance sold, must first be approved at Watson House, and all deliveries were subject to supervision. An initial production sample of the refrigerator was tested at Watson House laboratory for performance, general details of cabinet construction and finish, gas burner equipment, ease of maintenance, &c. Inside cabinet temperatures, ice-making

times, and gas consumption were measured in a room at 70° F. and at 100° F. at different settings of the thermostat. Special attention was paid to workmanship, standardization and soundness of gas-carrying components, gas burner design, governor design and performance, thermal efficiency of the heating unit and combustion at normal pressure, and an artificially obtained 50% pressure overload at the injector. As a part of the laboratory test, the refrigerator was examined by the instructors and maintenance staff of the Training Section, the Stores Testing Section (which specialized in details of design and workmanship of all gas appliances), and the Stove Works (which was particularly interested in problems of renovation and interchangeability of parts).

In addition, practical district tests were carried out on any model embodying a new principle or having a marked change in capacity. Those tests were controlled by the laboratory and gave valuable information on performance and gas consumption under practical conditions. It was found convenient to make use of the homes of the Company's employees or specially chosen consumers. Similar tests were carried out with a normal refrigerator in order to confirm the gas consumption figures estimated in the laboratory.

As a result of the laboratory tests, a discussion with the makers might lead to modification of the original sample submitted. A final sample was then tested, correct in every detail, and was held as a standard sample. Deliveries were constantly checked by the Stores Testing Section to ensure that the refrigerator received was in exact accordance with the standard sample. In addition, at regular intervals a sample refrigerator was withdrawn from stock and examined in detail in the laboratory.

Servicing in its simplest form was the maintenance of a gas governor, an aerated burner, and a single flueway; but in practice the modern service given with a gas refrigerator meant much more, and must be given by a trained staff having detailed technical knowledge. The fitter was responsible for connecting the refrigerator and checking up that it was complete and was operating satisfactorily. He was trained at a special refrigeration course at Watson House and was kept up-to-date by short "refresher courses" and by circularized information.

The maintenance fitter examined the machine twice each year and carried out then the normal simple maintenance duties. He also dealt with district complaints. He, too, was trained at Watson House, but by a more comprehensive course; in addition, he often received instruction at the makers' works. The service supervisor in charge of a district acted in an advisory capacity to his fitting staff and was able to detect at the outset any district trouble which might be developing. He was in regular touch with Watson House. He had received specialized technical training in the Training Section and the laboratories there, and was familiar with the details of manufacture at the makers' works. Women demonstrators from the Home Service Section, trained by that Section at Watson House, followed up refrigerators in consumers' houses shortly after they were fitted.

Through such channels the Training Section maintained constant touch with the district. It dealt with any unusual difficulties and had available a limited staff of specially trained experts to go out on the district if required. The Training Section was in close touch with the laboratories and obtained all its technical information from that source.

From such defects as occurred, valuable information should be obtained for the maintenance staff, the laboratory, and the makers. Each complaint or defect passed through the Training Section or the Stores Testing Section, and they, in conjunction with the Company's statistical officer, collected the records, compiled and analyzed them, and gave the results to the laboratory and the makers. The Technical Section and the laboratory were in constant touch with the manufacturer in order to obtain the maximum advantage from all experience available.

# A New Process of Liquid Purification

G. Léonet in *Bulletin de l'Association des Gaziers Belges*, 1936, 58, 297-319 (December), describes a new process for liquid purification covered by Belgian Patent No. 417242. The process, which gives complete purification from sulphuretted hydrogen and cyanogen and also effects removal of carbon disulphide and carbon dioxide, has been the object of extensive laboratory trials, but has not yet been transferred to a large scale, though it is hoped that semi-industrial tests at the Brussels coke-oven plant will shortly be carried out.

The process is based on the absorption of $H_2S$, $CO_2$, HCN, HCNS, and $CS_2$ by means of a 0·2 to 2·0% solution of caustic soda and represents a considerable improvement over the Seabord process, which latter employs sodium carbonate and to this fact owes its well-known inability to give complete removal of sulphuretted hydrogen. The first four impurities are absorbed in the form of their normal salts. As regards the carbon disulphide, the thiocarbonate first formed becomes hydrolyzed into carbonate and $H_2S$, which latter then reacts with excess caustic soda forming sodium sulphide as does the sulphuretted hydrogen originally present in the gas. The absorbent is regenerated by causticization with lime, the quantity of lime added being slightly less than that required to react with the sodium carbonate formed from the carbon dioxide of the gas and with a further amount introduced as make-up material to replace alkali converted into sulphide and cyanogen compounds. Thereby decomposition of the other sodium salts into calcium salts is avoided. It will be evident that the concentration of sodium sulphide, cyanide, and thiocyanate in the purifying medium gradually rises. When an appropriate concentration of the sodium sulphide (which, of course, is present in by far the greatest amount) has developed, the solution may be treated for recovery of sodium sulphide, which has a variety of uses and can find a ready market—for example, as a depilatory in the tanning industry, which provides its largest field of application. The value of sodium sulphide crystals ($Na_2S{\cdot}9H_2O$) is stated to be £5 5s. per ton, f.o.b. Antwerp, and a firm offer from a large chemical exporting concern for the purchase of the product up to any amount has been received.

Three possibilities exist for the disposal of the sodium sulphide. In the case of small works, the concentrated solution could be sold as such—namely, as a product containing 120 grammes $Na_2S$ per litre in winter or 150 grammes per litre in summer. A second possibility is the recovery of the sulphide in solid form by evaporation of the solution at atmospheric pressure or in a triple-effect vacuum concentrator. A third method involves concentration and crystallization, the mother liquor being employed for the preparation of zinc sulphide, which may be mixed with barytes to form lithopone. If desired, the thiocyanate may be recovered as the cuprous salt. Cyanide does not call for recovery since it becomes converted into thiocyanate by a secondary reaction. There is no effluent problem.

The calcium carbonate resulting from the causticizing operation may be sold as precipitated chalk or may be burnt to provide the lime used in the process. Since, however, 100 parts of calcium carbonate are worth more than 56 parts of lime, calcination may not be as remunerative as disposal by sale unless the carbon dioxide obtained as a by-product is put to profitable use.

The purification plant embodies a tower down which the absorbent flows counter-current to the gas. The spent solution passes to a vessel somewhat similar to a water-softening plant in which it is automatically treated with the requisite amount of milk of lime. Wood wool filters clarify the treated liquid and the calcium carbonate sludge is discharged by gravity to a centrifuge or vacuum filter. It may be washed, if necessary, to remove small amounts of soluble salts.

In view of the fact that concentrated solutions of sodium sulphide are liable to evolve sulphuretted hydrogen through hydrolysis, the outgoing gas, which is free from carbon dioxide, may be passed through a small secondary tower in which it is treated with sodium carbonate solution. The effluent from this tower is passed to the causticizing tank and provides the necessary make-up material. The process is started on caustic soda solution, but after the first day the only raw materials required are soda ash and lime.

Detailed trading balances are given for the treatment, per 24 hours, of 3½ million cu.ft. of gas containing respectively 240 and 600 grains of $H_2S$ per 100 cu.ft., the latter content representing average English conditions. It is claimed that the process will work at a profit, whereas, in the case of the simple Seabord, the Seabord recovery, the Petit, and the Thylox processes, purification involves an expense. Moreover, the trading profit rises with increase in the $H_2S$ content of the gas treated.

A feature of the process is the fact that it may be worked either before or after the ammonia scrubbers. In the former case, a pure ammonia solution may be produced by scrubbing the purified gas with condensed steam—for example, with the condensate obtained from the sodium sulphide concentrator.

# THE ACCOUNTS OF

# The Gas Light and Coke Company

**Further expansion of business is reported, added consumers numbering more than 40,000, with gas sales increased by 3·69%.**

In the early part of last month, we commented upon the fact that a statement issued to the Press by the British Commercial Gas Association was to the effect that the amount of gas consumed in the British Isles during 1936 represented an increase of 10,000 million cu.ft., or 3%, over the total of the previous year. The report and accounts of the Gas Light and Coke Company for the same period show their own results to be a trifle ahead even of this encouraging result, inasmuch as the Directors state that the sale of gas by the Company during the past year shows an increase of 3·69% over that of the preceding twelve months. A year ago the increase reported was over 1%, so it is evident that the Company have been securing their share of the "better times" upon which we have all been congratulating ourselves. The vitality of both their own business and of the Gas Industry in general is indicated by the fact that there has been an addition for the year 1936 to the number of the Company's consumers of 41,166 (which compares with an increase of over 37,000 in the previous year), and a net issue of 217,137 appliances sold and let on hire or hire-purchase.

After the payment of the dividends for the June half-year, and after contributing the sum of £20,000 to the Redemption Fund, and the sum due to the co-partners for the year under the provisions of the Company's Act of 1931, there is a total available balance of £907,367, out of which the Directors recommend the payment of dividends at the same rate as for the previous year—namely, 4% per annum on the consolidated preference stock, 3½% on the maximum stock, and £5 12s.% on the ordinary stock. This distribution, together with the further sum of £20,000 to be contributed to the Redemption Fund, will absorb £694,190, and leave £213,177 to be carried forward to the credit of the current year. This is £10,554 more than the £202,623 which was brought in.

## Capital Expenditure.

Of the total amount of capital authorized (£29,325,390), there had, at Dec. 31, been paid up and added on conversion or consolidation, the sum of £26,332,390, leaving an amount of £2,993,000 issued but not paid up. In addition, there is loan capital authorized to the total of £18,344,904, of which £1,899,637 remains unissued. The increased business done is naturally reflected in the Capital Account for the past year, where there is set down an expenditure during the twelve months of £1,679,459 (an increase of £317,419 upon the amount expended in 1935). To meet the requirements of the substantially augmented number of consumers, there has been expended during 1936 upon mains and service pipes £221,815, upon meters £403,677, and upon stoves £878,388. Lands have been acquired at a cost (including law charges) of £5,520, and there has been expended upon buildings and machinery £170,057. The figures just quoted are gross, inasmuch as there falls to be deducted £673,840, represented by sale of land £7,250, depreciation of steamships £15,590, depreciation of meters £225,215, and depreciation of stoves £425,785. This leaves the net addition to the Capital Account during the year at £1,005,619, as against a net expenditure in 1935 of £772,510.

Two Parliamentary Bills promoted by the Company passed through all their stages and received the Royal Assent last July. The first of these was to empower the Company to raise additional capital, and for other purposes; while the second provides for the affording of facilities to the Company for the installation of pipes, &c., in buildings during the process of erection in the Company's limits of supply by such local authorities as are for the time being authorized undertakers within the meaning of the Electricity (Supply) Acts, 1882-1935. The Company issued £700,000 3¼% redeemable debenture stock, 1956, in the spring, and £2,693,000 3¾% redeemable preference stock, 1970, in the late autumn. The final instalment on the preference stock not being due until early in 1937, the issue will be dealt with in the Capital Account appearing in that year's accounts.

## The Revenue Account.

Glancing at the Trading Accounts, it appears that the principal differences in 1936, when compared with 1935, are as follows: Coal, including all expenses thereon, has cost £473,045 more, the quantity carbonized having been 325,876 tons greater. On the other hand, the cost of oil, including all expenses, but less the value of oil tar, and of coke, &c., used in the manufacture of water gas, shows a substantial falling-off—of £72,685 in the case of oil, and of £20,637 in that of coke, &c. The amount expended upon the purchase of gas in bulk continues to grow, though at £20,438 it is not considerable. The amount spent upon wages in the manufacture of gas, which appears in the present accounts at £346,779, is £24,073 up on the year. In this connection, attention may be drawn to a statement at the foot of the Revenue Account, to the effect that the total wages paid by the Company for the year 1936 amounted to £3,580,438; the total salaries paid over the same period came to £1,069,438.

The larger output of gas and the greatly improved demand for coke at rising prices are, of course, seen to influence favourably the receipts side of the Revenue Account. Sales of gas by meter at 8·6d. and 8·7d. per therm (higher prices, authorized by the Company's Acts, have been charged in certain outer areas), and special contracts, including sundry processes, produced £321,716 more, and it is pleasing to see that once again there is some increase in the amount received for public lighting, which stands at the important figure of £233,780. The receipts for coke have gone up from £1,575,987 to £1,856,857. The receipts from breeze, tar, and tar products (including benzole) are also up, but there is some diminution in the returns from ammoniacal liquor and sulphate of ammonia.

From the expenditure figures in the accompanying table it will be noted that distribution of gas cost £245,727 more, while among other items co-partnership absorbs about £7,000 more, and annuities and contributions to super-

*Comparison of the Revenue Account for the Two Years* 1936 *and* 1935.

EXPENDITURE.

| — | 1936. | 1935. |
|---|---|---|
| | £ | £ |
| Manufacture of Gas | 5,418,431 | 4,931,914 |
| Deduct Revenue from Residuals | 2,410,629 | 2,119,280 |
| Net Cost of Gas Making | 3,007,802 | 2,812,634 |
| Distribution of Gas | 3,668,923 | 3,423,196 |
| Public Lamps | 148,327 | 124,422 |
| Rent, Rates, and Taxes | 662,509 | 705,751 |
| Management | 470,757 | 456,508 |
| Co-partnership | 122,404 | 115,208 |
| Annuities and Superannuation | 255,458 | 213,040 |
| Expenses *re* Issue of Stock | 59,326 | 43,429 |
| Other Miscellaneous Charges | 136,465 | 122,102 |
| | £8,531,971 | £8,046,290 |

RECEIPTS.

| — | 1936. | 1935. |
|---|---|---|
| | £ | £ |
| Gas Rental | 8,725,011 | 8,403,295 |
| Meter ,, | 427,510 | 402,240 |
| Stove ,, | 938,981 | 742,860 |
| Fittings ,, | 463,342 | 516,822 |
| Miscellaneous Receipts | 70,144 | 52,310 |
| | £10,624,988 | £10,117,527 |
| Gross Profit | £2,093,016 | £2,071,237 |

*Coal and Gas Oil Used.*

| | 1936. | 1935. |
|---|---|---|
| Coal Carbonized, tons | 3,325,285 | 2,999,409 |
| Gas Oil used, galls. | 8,096,904 | 12,785,417 |

*Gas Made – Therms.*

| | 1936. | 1935. |
|---|---|---|
| Coal Gas (including Purchased) | 255,650,950 | 232,117,614 |
| Carburetted Water Gas | 24,530,596 | 35,644,802 |
| Total | 280,181,546 | 267,762,416 |

*Statement of Gas Sales, Gas Used, and Gas Not Accounted For.*

| | 1936. Therms. | 1935. Therms. |
|---|---|---|
| Gas Sold, Consumer Sales | 245,465,936 | 236,724,388 |
| Sundry Processes | 14,096,166 | 12,345,384 |
| Correction for Temperature, &c. | 6,647,986 | 6,270,604 |
| Total | 266,210,088 | 255,340,376 |
| Gas Used | 1,872,967 | 1,768,870 |
| Quantity not accounted for | 12,098,491 | 10,653,170 |

annuation funds some £12,000 more. The Company's contribution under the National Insurance Acts is up by nearly £7,000, and expenses *re* issue of stock by £16,000. On the other hand, though rents payable account for a somewhat larger sum, the combined item of rents, rates, and taxes shows a falling off of £43,242. This follows a reduction of £64,588 in 1935, as compared with 1934. Charges under the heading of management, which showed a drop of £7,000 a year ago, are on the present occasion up on 1935 by £14,000, general charges having been responsible for more than the whole of this increase.

The receipts from rental of meters are more by £25,270, and from rental of stoves by £196,121; but rentals of fittings are down by £53,480. The result of all these figures is an increase in the gross profit of £21,780. After meeting interest and dividend charges, there will, as already remarked, remain a balance of £213,177 to be carried to next year's account, as compared with the £202,623 brought in.

### Balance-Sheet Figures.

Turning to the Balance-Sheet, it is seen that cash at Bankers and at Company's offices figures at £436,897, and stores on hand at a sum of £2,615,539. A year ago sundry debtors and debit balances totalled £4,992,954; they now appear at £6,843,212. Each item shows some increase, but by far the largest gain is under the heading of "Sundry Appliances, &c. (Deferred Payments)," which has risen from £1,970,183 a year ago to £3,386,705. This is an indication of the eagerness with which the public will embrace fair business proposals for enabling them to enjoy forthwith the luxury of first-class apparatus which, without such facilities, they might have to wait for years to obtain, even if they might ever hope to do so. The amount invested in Allied Undertakings is just about £4,000 higher, at £494,207.

# TWELVE MONTHS' EXPERIENCE OF

# Industrial Gas Installations

by
**A. E. WILSON,**
Industrial Gas Development Engineer, Huddersfield Gas Department.

From a Paper read before members of the Yorkshire Junior Gas Association at a meeting held at Sheffield on Saturday, Jan. 16.

### Non-ferrous Foundries.

*Metal Melting.*—In our district the firms subsequently referred to performed this operation by coke and oil—the coke-fired plant being of the crucible type, while the oil-fired was of both the crucible type and the open flame type.

The first job was the conversion of four 150-lb. pit fires from coke to gas for a firm who formerly used no gas. Conversion is a misnomer, for we pulled the old settings down and started afresh. While these were being built the firm bought a 500-lb. rotary barrel open-flame melting furnace, the four pits and the rotary barrel being supplied with air from a common fan. The pit fires are constructed of Morgan's Douglas circular bricks, backed by Fosalsil insulation brick and finished with 4½ in. common brick, the burners are by Brayshaws to pass 600 cu.ft. per hour with air at 1 lb. The control taps—one gas and one air quadrant cock for each pit—are mounted in pairs on a wall so that all are within arm's length of the attendant. The rotary barrel furnace is opposite the pit fires so that the furnace attendant has all his plant under his eye. This same firm shortly after the installation of the above plant bought an Ashworth Bale-out furnace for aluminium die casting work; this, of course, was equipped with a natural-draught burner.

Immediately following the building of the pit fires for this firm we received an order for five similar pit fires from another concern. This firm was already quite a large consumer, but had been losing confidence in gas. We are now, however, happily re-established in their good books—so much so that they have equipped themselves with a gas-fired core oven of the portable steel frame type to work with the five gas-fired pit furnaces. Again, as in the case of the first firm, their mould and core ovens used in the iron foundry have been converted. We followed almost immediately with the conversion of two 150-lb. oil-fired pits and the supply of a new 400-lb. tilting crucible furnace for a third firm.

*Ladle or Shank Heating.*—When metal is melted in an open flame or reverberatory furnace it is run from the furnace into a ladle or shank, from which it is poured into the moulds. These shanks have obviously to be heated to prevent the metal "freezing"—*i.e.*, setting on the walls of the ladle. It was found that the simplest method of heating the ladles was to invert them over a luminous gas flame. In the case of the first firm three points were provided, consisting simply of a plug with a $\frac{7}{16}$ in. hole, each point being controlled by a stout cock with a key that could be knocked on or off by the man's foot—a small pilot light being provided for each jet. These shanks were unlined; they were just steel.

Coming now to lined shanks, or steel ladles lined with ganister, the third mentioned firm, although now doing some of their melting with gas, had at the beginning of 1936 two oil-fired open flame furnaces both melting gunmetal, admiralty, and phosphor bronze. They had been heating their ladles by oil, but after a demonstration of an entirely new method using gas—we got the job. The alloys being poured at high temperatures, it was necessary to bring the inside of the ladles to a red heat—I estimate that we are now working at about 600°-650° C. This required an air blast injector arranged with three nozzles vertically at 1 ft. 4 in. centres, the inverted ladles being supported over the nozzles on a mild steel angle iron frame. The heating time for a 12 in. by 12 in. shank is 12-14 min. An exactly similar arrangement is used by the same firm for the ladles used in connection with special high-temperature alloys melted in electric furnaces. The consumption is 160 to 180 cu.ft. per hour per nozzle, or 35 to 45 cu.ft. per ladle.

### General Foundry Work.

In one firm's steel foundry there are a large number of intricate moulds which have to be what is called "skin-dried." This was being done by hand blowpipes such as plumbers and painters use. But the men were of opinion that this was not an ideal method, as the flame was too fierce—in fact, they themselves suggested a long, languid gas flame. There were, however, several snags. A luminous flame, while soft, would deposit carbon and would be too languid to reach the deeper recesses. A semi-aerated flame, using a small atmospheric injector, would also be impracticable, due to sand and the usual foundry dust clogging up both the nipple and the air ports. Low-pressure air admitted to give a partial mixture—say, 1 or 1½ to 1—seemed the best method, but such a supply was not available and the process did not warrant any very great financial outlay. It was accordingly decided to use foundry air—*i.e.*, the air at 95-100 lb. pressure used in the moulding machines, &c.

There were already in the foundry three air points with 30 ft. flexible hoses for blowing the loose sand from the moulds, and it seemed obvious that three more similar flexible hoses would be a nuisance and a complication. A special brass bush was therefore made with a nipple with a 3/64 in. hole. This was inserted into a ¾ in. by ½ in. tee, the gas entering the tee by one ¾ in. end behind the nipple, which induced the gas and pushed the partial mixture through the other ¾ in. end, to which was attached the flexible hose. If the moulder wishes to blow the sand from his mould he shuts the gas tap and opens the air tap to the full, the 3/64 in. orifice passing quite enough air for this purpose. If he wishes to use the skin drying flame he shuts off the air, turns on the gas, lights his torch, and adjusts the air valve until the flame is the correct length, thus using only one flexible hose for both operations. This

apparatus has been repeated three times in the non-ferrous foundries of the same firm.

### Cores and Moulds.

Cores consist of sand suitably bonded to give a hard compact mass with a definite transverse strength. It is sufficient to mention just two bonds—water-bonded cores and oil-bonded cores. With water-bonded cores, wet or green sand may, of course, be used; but with oil-bonded cores it is customary to use dry sand, which leads to the next job—sand drying.

The apparatus consists of two concentric revolving drums—slightly inclined—the heat passes down the inner tube around the end of this tube and back along the annular space—the sand being fed into the higher end of the outer drum. This operation was being carried out with an oil burner, and such was the disposition of the heat that the wet sand was suddenly dried at the top end of the drum, the remainder of its travel down the drum being not only of no advantage from a drying point of view, but a definite disadvantage, as the sand was discharged too hot to handle and had, in fact, to be spread out on a stone floor to cool.

A gas burner was therefore procured which would produce a long flame. It consists of an air blast injector using air at 18 in. W.G., which creates an air to gas ratio of 1½:1, the remainder of the air required for combustion being fed along a concentric pipe so that mixture takes place at the burner nozzle; this plant is now operating with a flame about 3 ft. 6 in. to 4 ft. long and is drying more sand per hour—the sand also being discharged at a much more reasonable temperature. The maximum consumption (8 a.m. to 10 a.m.) is 600 cu.ft. per hour, reducing to 300-350 cu.ft. per hour until 4.30 p.m. The output of dry sand is 20 cwt. per hour, with weekly consumption of 15,000-20,000 cu.ft.

The cores having been made—either water or oil bonded—they have to be dried and baked. This used to be done, and is still done in a few instances, by radiant heat—a large brick built oven with an external coke fire, the flues from which passed under the floor of the oven. Gratings were often left in these flues, but became choked with dust, and, in any case, when they were open their effect was detrimental, as sulphur dioxide passed into the oven and created a white deposit on the moulds, which prevented the complete graphiting. The cores and moulds were unevenly heated, those on the floor being ready before those higher up, so that the system of air heating was an obvious remedy.

The same brick built oven and the same coke fire, now equipped with a fan, were then used. The fan delivered air both through the fire and along with the products of combustion, the mixture then passing into the oven through suitable openings, usually in the floor at the back of the oven, and away from the oven through more openings in the floor just inside the door. This method dries perfectly, but although the $SO_2$ content is greatly reduced by the air diluent, it is still sufficient to create a bloom on the moulds. Again, it is impossible to control the temperature of the oven accurately. Using town gas, however, for heating core ovens, either by means of individual air heater units, such as the "Serckulator," or by rail burners in the oven itself—the atmosphere of the oven is practically free from $SO_2$, so much so that men can enter the oven while it is working to put in or take out moulds and cores, and, more important, the temperature of the oven can be accurately controlled. Another feature is the reduced baking time. Common practice was, and still is, to charge the ovens during the day and leave them to "cook" all night. Even then all the moulds were not dried; but with gas heating small cores can be baked in 1 hour and moulds dried in 1½-7 hours, up to 1½ ton moulds.

The use of gas also lends itself to the system of continuous core drying with the conveyor oven of either the horizontal or vertical type. The system evolved for the conversion of coke-fired brick built core and mould ovens is a combination of the internal rail burner and the fan-derived forced air circulation methods. One of the chief reasons, apart from simplicity, was the avoidance of any questions of chimney pull. By using a fan, not only is the chimney rendered unnecessary, but a positive pressure can be maintained in the oven, stopping the ingress of cold air at the door.

### Cast Steel Annealing.

A firm which formerly annealed their steel castings in two semi-direct coal-fired bogie batch type furnaces is now using two gas-fired bogie batch type furnaces built by Priest Furnaces, Middlesbrough; they are fired by low-pressure air with gas at normal pressure.

It would perhaps be of more interest to record not the normal working of these furnaces, but the difficulty which was encountered and how this was overcome. It was found that even with a reducing atmosphere in the furnace the castings were scaled, and this was eventually found to be due to water. This water had been deposited in the base of the brick chequer work from the cooling waste gases, and on the cycle being reversed it was, of course, blown back with the air into the furnace. A by-pass connection was therefore arranged by which a small quantity of gas could be burned down that half of the chequer work through which the waste gases were then flowing; this was sufficient to raise the temperature of the chequer work and prevent a deposition of moisture. Although this burning of gas would appear at first sight to be a direct waste, such is not the case, for although it raises the temperature of the waste gases passing to the atmosphere, it also raises the temperature of the chequer work, and this latter heat is recovered and taken back into the furnace by the air passing through when the furnace is reversed.

Two other jobs installed by a firm are of interest. The first is a heat treatment furnace of rather an unusual nature. It has a temperature range of 400°-1,360° C. with atmosphere and temperature control. The size of the muffle is 3 ft. 6 in. by 2 ft. 3 in. by 1 ft. 6 in. Heating is effected by means of British Furnaces equipment using air at 1 lb. At the opposite end of the burner tunnels to the British Furnaces air-cooled nozzles are situated small 100 cu.ft. air blast burners and nozzles. The method of procedure is to light up the furnace with the British Furnaces equipment and work until the combustion chamber is hot enough—that is, red heat—and then light the other burners. In the case of temperatures up to 800° C. it has been found that the British Furnaces equipment can be left on up to 50° C. below the temperature required, then switched off and the small burners turned on. This furnace has already worked at the following temperatures: 400°, 480°, 600°, 760°, 880°, and 950° C.

Another job was the equipment of a new canteen to provide dinners for staff and workpeople. Equipment has been installed capable of providing 650 meals per day. The whole of this equipment except the refrigerator is gas-fired.

### Wire Galvanizing.

During the year we have converted a 12-ton galvanizing bath from coke to gas. This bath is fired by eight air blast burners using air at 21 in. W.G. firing down into a bed of broken refractory material under the bath. It is manually controlled and consumptions of the following order have been obtained:

> Time to raise from cold to 470° C. approximately 14 hours.
> Consumption, 28,000 cu.ft.
> Working consumptions 450-600 cu.ft. per hour with 24 ends of 18½-12 S.W.G. wire passing through at 32 yd. per minute.

Since the installation of this bath we have put into commission two small baths for fine wire tinning, and in the course of the next few months we shall be completing the conversion of other galvanizing equipment. I might mention in connection with this job that we have not only converted plant to gas firing, but we have created a good spirit by re-designing the lay-out of their galvanizing department—not a point of technical interest, but definitely a good selling point.

In addition to the installation of the usual central heating jobs, we have during the year carried out a conversion of a cast-iron sectional boiler with Dockings "Duoflam" equipment. This presents one interesting feature. The plant is entirely controlled from the Managing Director's office, the room thermostat, the electric impeller pump switch, and the time control clock all being situated in his room. As far as we can gather at this stage—that is, half-way through the heating season—the conversion is giving every satisfaction, not only from the heating capacity point of view, but what is more important, from the £ s. d. angle.

With further reference to Dockings "Duoflam" burner equipment—but not in connection with central heating—we have recently installed these burners for the heating of cast-iron pots at a large chemical works in our area. These have been from coal firing, and I anticipate, in view of the favour with which the installation has been received, that further work awaits us in this direction, particularly as this consumer is already our second consumer from point of size.

## Discussion.

The PRESIDENT (Mr. E. R. B. French, Leeds) congratulated Mr. Wilson on his able dealing with a very interesting subject. The development of industrial gas for anybody in the Gas Industry demanded a considerable amount of sound knowledge in relation to the particular industries one hoped to supply, and especially was this so where they hoped to get furnace work. The industrial side of the Gas Industry was, to many of the members of the Yorkshire Junior Association, comparatively new, but it was a side which held a very big future. Therefore it behoved gas men not to tackle industrial work of

any description without finding means to make themselves thoroughly conversant with the requirements of the prospective consumers. It was essential that in seeking to develop an industrial gas load, the man responsible must be sufficiently familiar with the processes the gas was to serve to be sure of leaving a sound and satisfactory job.

A point which had occurred to him while Mr. Wilson was speaking had been possibilities in an industry now growing very rapidly—that of aeroplane construction. This was an industry which might not affect all of the members of the Association, but they could all hope it would affect their gas output very beneficially wherever any section of the aircraft industry was established. It seemed that this was a side of industrial gas which afforded a very good field for the salt bath, and he would like to know whether Mr. Wilson had had any experience, and had any views, on this phase of work. Mr. French said he had been much interested in Mr. Wilson's remarks on the fitting of works canteens, this again being a side of industrial gas which held great present and future possibilities and should be given careful attention. One of the first essentials in tackling canteen equipment, of course, was to ascertain the number of persons likely to use the canteen. A second question which often arose, and had to be taken into consideration in equipment, was as to whether the canteen was solely concerned in supplying complete meals or was likely to incorporate a good deal of service of cups of tea, &c., and the warming up of foodstuffs brought by the workpeople themselves. Many lower-paid workpeople made this latter a common practice, because the cheapest of full meals each day in the working week was beyond the pocket of a lot of workers. An important factor was to prevent unnecessary running about or waste of space. Another important point was that of ventilation of a canteen, a matter on which, he believed, Mr. Wilson had not had occasion to touch that day. Mr. French noted that the lay-out to which Mr. Wilson had referred was carried out by a London firm who were doing extensive canteen work up and down the country; but Mr. French said he had rather a preference, where reasonably practicable, for the gas undertaking of the district to carry out the installation itself. He mentioned this because some people outside the Gas Industry were rather disposed towards an equipment including an electric oven, with a gas hotplate, and this, of course, would affect the gas consumption substantially. Another point was that if they had a boiler system and there was any possibility of utilizing any of the surplus steam, that also would minimize gas consumption. The President said he was happy to hear how well the gas load for central heating was progressing in Mr. Wilson's area. To secure this progress it was essential to have a price for gas which would compete favourably not only with electricity but with oil, which was a much keener competitor. Unless they could offer gas at a price enabling them to submit a proposition which would be beneficial to the prospective consumer, he was afraid they were up against a stone wall.

Mr. G. GRIFFITHS (Bradford) assumed Mr. Wilson used a steel case with the crucible furnace, and he was wondering how he went on with the top castings—whether he had a suitable job for it.

Mr. WILSON: There is no steel case. It is finished with common brick.

Mr. GRIFFITHS also asked whether Mr. Wilson made a regular practice of using back pressure valves on foundry jobs.

Mr. WILSON: No back pressure valves are used.

Replying to the President, Mr. WILSON said he believed in his area there were only four or five salt baths, and the technical people working them appeared to have very mixed views. Two firms had not only a salt bath but back hardening, and they did not know yet which they preferred. The question of salt baths lay in the operator's hands, and, apart from pointing out the obvious advantages, Mr. Wilson said he found it advisable to leave it entirely to the consumer's preference. He could say, with somewhat bitter reflections, that salt baths were somewhat of a mixed blessing—not due to the salt or the fumes or the work, but to the methods of heating and construction of the bath. Those of the meeting who were members of the Yorkshire Industrial Gas Centre would recall some observations regarding one particular salt bath. It had been re-bricked twice and needed re-bricking again. Fortunately, it had been thrown out and a proper one put in its place. The matter of firing salt baths seemed still to leave a good deal to be desired. The heating of the top plate and separating the salt appeared to be difficulties which had not been overcome. His experience of salt baths had not been too happy; in addition to which the consumers in his area seemed to be satisfied with back hardening. In answer to the questions about the works canteen, it was specified to provide a certain number of complete meals for a certain number of workpeople per day, at 9d., 8d., and 6d. per meal, with a penny extra for tea. In this particular case there was no provision for warming the workpeople's own foodstuffs, and no permission was given for this practice. Ventilation was provided by the installation firm. It was built into a single-storey steel trussed roof shed with glass roof and already fitted with a hot air system which heated the canteen in the winter: the extractor ducts did the ventilation all the year round. With regard to outside firms equipping canteens, he could not entirely agree with the President's view. The primary object was to sell gas for the industrial load and, frankly, it did not matter who made or sold the apparatus so long as one obtained the gas load.

Replying to further members' questions, Mr. Wilson said with the double-burners system the small burners were not used to raise temperature but to maintain temperature at a pre-determined level. The atmosphere was applicable on the B.F. equipment or the small burners. The valves were set so that the mixture was the same as the mixture passing through the B.F. equipment, so that the atmosphere passing was the same all the time. All the castings were of light section, and the runners and headers weighed as much as the casting itself.

Mr. Wilson was accorded hearty thanks for his Paper on the motion of Mr. J. L. ROBINSON (Sheffield), seconded by Mr. C. A. NEWHAM (Leeds), and the AUTHOR briefly responded.

## Athletic and Social

### Cambridge Recreation Club Dinner.

Nearly 250 members, relatives, and friends of the Cambridge University and Town Gas Light Company Recreation Club sat down to dinner at the Dorothy Café on Jan. 23.

Mr. J. F. Cameron (Chairman of the Board of Directors and President of the Club) presided, and he was supported by Mrs. Cameron, Mr. F. J. Dykes (a Director of the Company and a Vice-President of the Club), Major H. McCombie (Director and Vice-President), Mr. P. W. Gray (Director and Vice-President), Alderman H. T. Wing (Director and Vice-President), Mr. J. Hunter Rioch (Engineer and Manager and Vice-President), Mr. A. E. King (Secretary and Vice-President), Mr. W. R. Elworthy (Auditor), Mr. W. G. Bradford (Accountant and Vice-President), Mr. H. R. Thomas (Assistant Engineer), and Mr. H. Sword (Superintendent).

Before calling on the proposer of the first Toast, the Chairman asked all present to stand for a few moments in memory of Mr. H. Shewring, late Engineer and Manager of the Company.

The Toast of "The Cambridge University and Town Gas Light Company" was proposed by Mr. J. Hunter Rioch, who said that the year just closed had provided the Company with yet another record output of gas. He thought that by this time next year the Company would be ranked among the 40 odd gas undertakings making 1,000 million cu.ft. per annum, or over. "As one who has been engaged on gas-works in various parts of the country," said Mr. Hunter Rioch, "I can safely say that never before have I been privileged to be associated with a more up-to-date works; and this is very largely due to the foresight of the Board of Directors."

In conclusion, Mr. Rioch paid tribute to the valuable assistance he had received from several members of the staff, particularly during the last few weeks.

Major McCombie, responding, said that when one looked back on the year 1936, one saw that the Company had made considerable progress. He expressed appreciation of the work done for the Club by its officers. The Club did much for the well-being of the Company.

"Our Club and Officers" was proposed by Alderman H. T. Wing, who said that he believed the importance of the Club to the work and life of the Company was so great that it could not be over-stated.

Response was made by Mr. W. D. Robinson, who said he felt sure all appreciated the splendid support given the Club by the Board of Directors. Membership now, he said, was nearly 300.

Following the dinner there was a concert and dance programme.

The General Committee responsible for the arrangements were: Messrs. A. Bowman (Chairman), S. A. Mann (Vice-Chairman), S. G. Newman (Treasurer), W. Baker (Secretary), S. Halls (Minute Secretary), H. Bowman, E. Cowell, W. Newman, J. Mansfield, G. Greenwood, S. Watson, F. Richardson, E. Cooper, F. A. Russell, F. Halcrow, W. Asplen, W. Webb, W. Robinson, H. G. Kirby, and E. Tarrant.

### Eastbourne Co-Partners' Supper and Dance.

The Tenth Annual Supper and Dance of the Eastbourne Gas Company co-partners was held in the Town Hall on Jan. 21. Mr. Eliot Williams (Managing Director) presided in the absence of Mr. Frank Jones (Chairman of Directors). Among those present were Mr. B. Bradford, Mr. F. Barraclough, Mr. H. F. H. Jones, and Mr. H. J. J. Price (Directors), Mr. S. E. Knowles (General Manager and Secretary), Mr. S. W. Hammond (Engineer and Works Manager), Mr. W. T. Charlwood (District Manager), Mr. H. Worley (Auditor), Mr. C. J. B. Sawbridge (Chief Clerk and Accountant), Mr. E. A. Smith (Works Superintendent), Mr. P. E. Browne (General Manager of the Brighton, Hove, and Worthing Gas Company), and Mr. G. Evetts.

In the course of the evening Mr. Eliot Williams presented the sports trophies won by members of the staff during the past year, including the Eastbourne Cup, won by the Company's football team last season.

### Hastings New Year Party.

Employees of the Hastings and St. Leonards Gas Company and their relatives to the number of 250 attended the annual New Year Party for co-partners at the Hastings Pier recently. Mr. C. F. Botley (Engineer and General Manager) presided, and among those present were Mr. A. M. Apel (Director) and Mr. C. L. Davis (Chief Cashier). After tea the party attended a pantomime at the White Rock Pavilion.

### Newcastle Welfare Club.

The Newcastle-upon-Tyne and Gateshead Gas Company's Welfare Club Dance and Whist Drive in the Brighton Assembly Hall attracted about 400 guests. Whist prizes were presented to the winners by Mrs. Henderson, wife of the Vice-President of the Club.

# Review of the General Meeting of the Union Syndicale de l'Industrie Technique du Gaz en France

(*Concluded from p.* 219.)

## Coke Quenching Apparatus for Small Works

P. Faucher described a small coke skip which provides a convenient appliance for the quenching of coke on a small works. A basket having the shape of a horizontal semi-cylinder and built up from spaced steel strips is mounted on a two-wheeled chassis in such a way that, when the rear end of the chassis is raised, the basket is detached and lowered to ground level. This operation is carried out in front of a small sump of water into which the basket with its charge of coke is then lowered by means of a self-reversing electric winch driven by a ¾ H.P. motor. The period of immersion is 5-6 seconds, at the end of which time the coke is fully quenched. The basket is then raised by means of the winch and reseated on the chassis by lowering the rear end of the latter. The winch is operated by a push-button starter and the operations of lowering the basket into the sump and of raising it again each last 15 seconds. While on its chassis, the basket can be tipped by means of a chain-pull so as to discharge the quenched coke.

The sump is situated below ground level and is brick lined. It has a capacity of 150 gallons of water. The consumption of water is 4½ gallons per hundredweight of coke. When three successive charges of coke have been quenched, the temperature of the water in the sump is about 90-95° C. and the hot water can be employed for any suitable purpose.

## A New Branch-Pipe Collar and Pipe Joint

Two new pipe fittings were described by É. Berriat. The Secur branch-pipe collar serves for the connection of a service pipe to a main. Two stirrups, their ends joined by means of bolts, cover the whole circumference of the main. The service pipe is bolted to one of the stirrups by means of a rubber-lined stuffing box containing a short internal tube of unoxidizable metal which guards the rubber against extrusion into the offtake hole of the main.

The Secur pipe joint serves for the connection of butt-ended mains. Use is made of a short sleeve held in position by two hollow flange-pieces each containing a rubber ring. The flanges are drawn together by means of two bolts. The joint will withstand a pressure of 130 atmospheres.

## Coal and Coke Handling Plant at Nantes

Ch. Delahaye presented a description of the coal and coke handling plant at Nantes. For the handling of coal in the coal park, a drag scraper is employed. This offers the advantages of low capital cost, simplicity, adaptability to extension and safety. Band conveyors are employed for the transport of the coal from the park to the bunkers of the carbonizing plant and for coke handling. Provision has been made in the scheme for the future addition of coal blending plant.

## Reports of Committees

*Manufacture.*—The report is devoted mainly to a dissertation on the control of gas manufacture. On the basis of replies received in answer to a questionnaire addressed to 43 works, consideration is given to temperature and pressure control, the measurement of gaseous volumes, the weighing of coal and coke, analytical and testing methods, systematic records and appropriate forms for their presentation, &c.

According to the report, of the 695 French gas-works, 400 have a daily make below 35,000 cu.ft., 200 have a range of production between 35,000 and 210,000 cu.ft., 50 between 210,000 and 525,000 cu.ft., 30 between 525,000 and 1,225,000 cu.ft., 10 between 1,225,000 and 3,500,000 cu.ft., and only 5 have a make exceeding 3½ million cu.ft. per day.

*Tar, Benzole, and By-Products.*—A *résumé* is given of methods available for the recovery of benzole and of existing French practice at various works.

*Distribution.*—The work of the Committee on distribution has been concerned with the standardization of pipe flanges and with a continuation of the investigation of rubber gaskets. Work on the preparation of a further volume of the manual of gas supply is proceeding.

*Propaganda.*—No appliances worthy of financial prizes were submitted to the Committee during the year. A few new appliances were, however, deemed worthy of being brought to the notice of the Gas Industry and include a gas valve with twin regulation, an attachable governor-burner which can be fitted to instantaneous water heaters not provided with such a device, an automatic arrangement for annulling the effect of down draught in instantaneous water heaters, a draught regulator, a Bunsen burner with a device for the prevention of firing back, the Isothermeur unit heater, and a gravity-feed device for coke-fired boilers.

## The "Isothermeur"—A Unit Gas Heater

According to P. Magnan, the obstacle to the development of the use of gas for central heating purposes is no longer the cost of the gas since special heating tariffs are now widely in force. What does militate against the use of gas for heating is the high capital cost of central heating installations.

The Author set himself the problem of devising a unit heating system which should embody the following features: Rapid rate of temperature rise in the air of a room, attainment of a uniform temperature throughout the room, a constant and high efficiency, perfect safety, automatic regulation, easy installation without extensive alterations to the room, ventilation of the room and dust elimination from and humidification of the air. The heater which was evolved has been termed the "Isothermeur."

The appliance takes the form of a tall rectangular structure and possesses the advantage that it can be attached to an external wall of a room, though a model which can be connected to a chimney is also available. At the base of the heater, the air of the room is drawn in *via* a dust filter consisting of oil-filmed plates. The dust removed by this filter is, incidentally, a good selling feature from the psychological aspect. Above the filter is a thermostatically controlled burner the gas supply to which is controlled by the temperature of the air entering the heater—*i.e.*, the room air. The burner is surmounted by a combustion chamber of large surface, the combustion products passing upwards through an internal flue connected, in the case of the wall model, to a baffler and terminal. As the air of the room circulates through the appliance, the requisite portion for the combustion of the gas passes to the burner and exhaust system; the remainder becomes heated by contact with the flue and, having reached the top of the heater, is discharged horizontally into the room by means of a baffle plate surmounted by a vessel of water, evaporation from which serves to humidify the air. The air of the room is thus constantly circulated through the apparatus and conditioned. At the same time, ventilation is secured by the infiltration of air, replacing the evacuated air which has served for the combustion of the gas. The model just described has a capacity of approximately 8,700 B.Th.U. per hour. Modified forms of the heater have been designed for larger capacities and embody vertical convector tubes.

Two forms of thermostatic control have been devised—one type working on the "all or none" principle and the other affording a gradual adjustment of the gas consumption. Clock control of the burner can be provided.

A further advantage of a system of unit heaters—for example, in halls or cinemas—is the fact that the installation of a single unit soon affords a demonstration of its utility and efficiency. Thus a client who sets out with the idea of merely effecting a slight improvement in the atmospheric conditions may, later, come to realize the advantage of securing a perfect installation and may, as a result, extend the number of units.

As regards the intermittent heating of public halls, two possibilities arise. The heating equipment may be large so as to provide rapid heating. This involves a relatively high capital cost and a small consumption of gas. Alternatively, a slow rate of heating may be provided, in which case the capital cost is lower though the gas consumption is higher since a longer period is required to heat the hall and the radiation loss extends over a longer period. Heating costs for a single meeting or session in relation to the desired temperature rise and the size of the installation can be evaluated by means of a graphical method developed by the Author, who explains, also, the aerodynamic principles on which the working of the "Isothermeur" is based.

It is stated that the small model can be supplied to gas undertakings at a cost of approximately £3 10s. The cost of a larger unit with a capacity of 60,000 B.Th.U. per hour is about £12 installed.

# Baffler Performance

## IN RELATION TO THE SAFETY OF GAS APPLIANCES

By
T. J. LEGG, B.Sc. (Lond.)
*(Messrs. R. & A. Main, Ltd., formerly of the Gas Light and Coke Company, Watson House), and*
T. G. NOBLE, B.A. (Oxon.), A.M.I.H.V.E.
*(Gas Light and Coke Company, Hot Water and Ventilation Laboratory, Watson House).*

A Paper read before members of the London and Southern District Junior Gas Association at a meeting held at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 1, on Friday, Jan. 22—the PRESIDENT (Mr. R. Summerson, of Luton) in the chair.

(*Continued from p.* 216.)

### V. HOW NEARLY CAN A BAFFLER APPROACH PERFECTION?

We cannot at present answer this question and may never be able to by the application of purely theoretical considerations. There are in a baffler two streams of gases of different temperatures, densities, and viscosities, converging at various velocities with various degrees of mixing. When it is remembered how complicated is the formula for the flow of a single stream of gas round so simple an obstacle as a circular flat plate, it will be understood that the problem of accurately forecasting the performance of a baffler merely from a knowledge of its dimensions is extremely difficult. We therefore tried a more practical method of approach—viz., to test as many existing types as we could in the hope that out of the chaos of apparently disconnected results there would emerge some order which would ultimately enable us to understand clearly and predict the effect of variations in details of the bafflers.

An examination of the results obtained has confirmed that not only does the form of the $CO_2$-downblow curves show a general similarity, as we have already mentioned, but that as would therefore be expected, so do the static pressure-downblow velocity curves obtained by measuring the static pressure at the same point in the primary flue as the $CO_2$ samples.

If $y$ = static pressure in primary flue,
and $x$ = downblow pressure (dynamic head)

an equation of the form $y = \frac{ax^2 + bx + c}{x + d}$, where $a$, $b$, $c$, and $d$, are constants depending on the dimensions of the baffler and the characteristics of the appliance, appears to satisfy with a fair degree of accuracy the behaviour of certain bafflers, excluding those which are fitted too close to an appliance or subject to disturbing suction or pressure effects at the base thereof. It is put forward only tentatively as we have not yet had an opportunity of checking up how complete is the agreement obtained with all the bafflers we have tested, nor have we been able so far to understand the significance of all the constants It is, however, suspected that the constant $a$ is that obtained by measuring the ratio between the static pressure in the primary flue of the baffler with the primary inlet capped and the downblow pressure, and that the constants $b$, $c$, and $d$ are all functions of the gas rate and probably of the dimensions of the baffler.

### VI. GENERAL POINTS OF BAFFLER DESIGN AND PERFORMANCE.

As an introduction to our comments on the effects of certain general features in design and performance we quote L. C. Price[14] on the features common to good bafflers.

(i.) "They provide ample room for the passage of combustion products both up the chimney and to the atmosphere."*

(ii.) "They all provide that air drawn from the surrounding atmosphere by updraughts shall pass in a slow and orderly fashion by the inlet openings of the hoods so that only negligible venturi effect is produced."

(iii.) "They all have baffles of ample size so as to prevent downdraughts from impinging on the inlet openings and so opposing the entrance of combustion products."

(iv.) "All have ample room for down currents to pass to atmosphere without building up pressure in the hoods."

With these remarks we are substantially in agreement but we repeat that in our opinion the performance of a baffler by itself cannot be adequately specified, but must be considered in relation to the appliance to which it is fitted.

* *I.e.*, through the relief outlet.

Comments (i.), (ii.), and (iv.) are sufficiently self-evident to need no further explanation. Comment (iii.), however, may be expanded considerably. Certain results we have obtained have led us to believe that it is not sufficient merely to design the baffle plate in such a way that downblow just misses the primary outlet, but that it is necessary to ensure that the air stream shall be deflected well clear of it. We have tested a number of bafflers by measuring the static pressure in the capped primary flue when the baffler is subjected to downblow apart from the appliance. All the good bafflers we have examined in this way produce a suction inside the primary flue at all down-

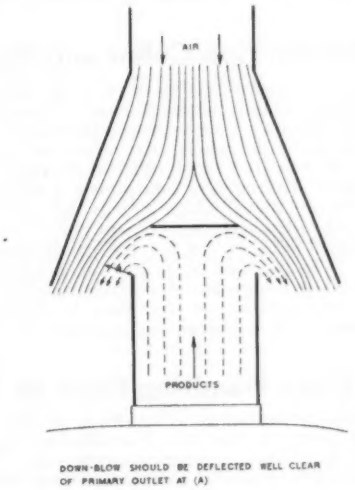



Fig. 6.

blow velocities, yet give a slight but definite increase in the $CO_2$ and static pressures produced at low velocities when they are fitted to an appliance. Furthermore, some quite bad bafflers similarly give a suction in the capped-off primary flue at all downblow velocities. We have noticed that many of these bafflers are designed in such a way that the downblow stream misses the primary outlet but allows only a small clearance (see fig. 6).

If our view is correct there is some justification for expecting that bafflers tested on appliances having flue outlets with a considerably smaller nominal diameter than that of the baffler would give favourable results, and yet fail if tested on an appliance with higher output of flue gases, for the reason that the clearance at A (fig. 6) may be large enough to accommodate the products from the small appliance without appreciable restriction (*i.e.*, rise in $CO_2$) but not from the larger. We have found this conclusion to be confirmed in practice.

Similarly the effect of varying gas rate on the performance curves of a bad baffler (fig. 7) show that the $CO_2$ rise due to downblow is greater as a percentage of its original value at high gas rate than at low, a further confirmation of our reasoning, again indicating the need to test a baffler on the appliance with which it is to be used.

The existence of eddies is to be expected down stream of a plate under downblow. This appears to be confirmed by $CO_2$ contours taken across a baffler (fig. 8). It may

be that the $CO_2$ increase at low velocity with most good bafflers, followed at higher velocities by a decrease, is caused by the eddies coming up nearer to the primary outlet at low velocities.

In this context we would particularly emphasize that for the purpose of obtaining a better understanding of the mechanism of the phenomena which are taking place, location of the flow lines is essential. We have therefore

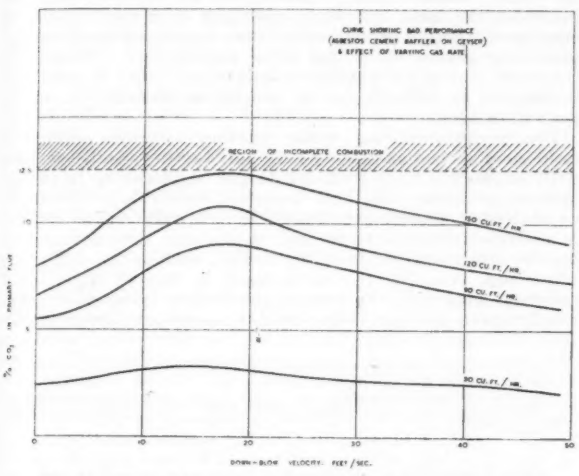
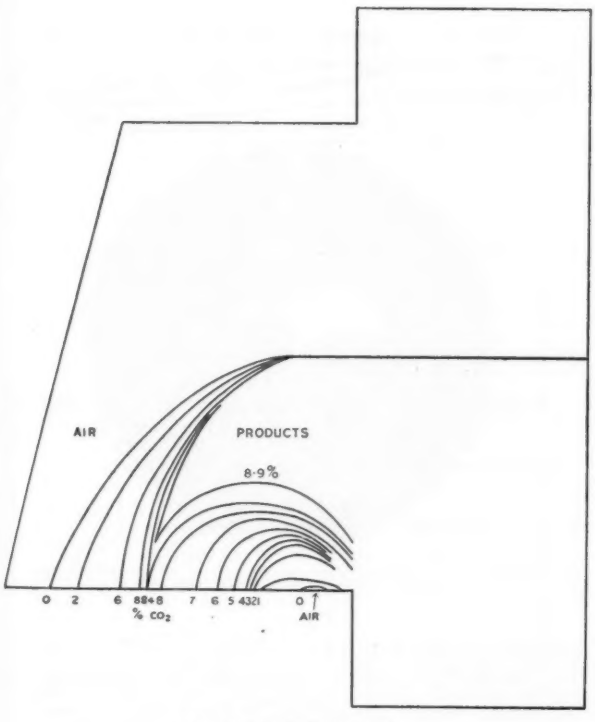

CURVE SHOWING BAD PERFORMANCE
(ASBESTOS CEMENT BAFFLER ON GEYSER)
& EFFECT OF VARYING GAS RATE
REGION OF INCOMPLETE COMBUSTION
150 CU. FT. / HR.
120 CU. FT. / HR.
90 CU. FT. / HR.
30 CU. FT. / HR.
% CO2 IN PRIMARY FLUE
DOWN-BLOW VELOCITY: FEET / SEC.

Fig. 7.—Effect of Varying Gas Rate in Performance Curve of Bad Baffler.




$CO_2$ CONTOURS IN BAFFLER HOOD

Fig. 8.

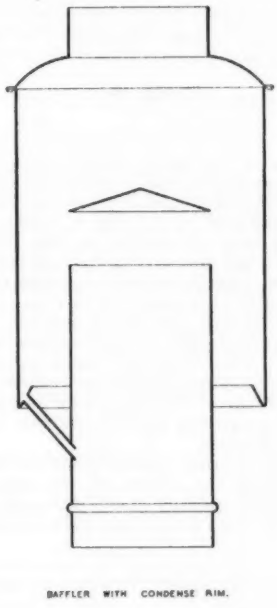
thought it worth while to append a short bibliography on the visualization of gas flow.[32 43]

*Dealing with Condensation.*

There is another feature of baffler design on which we have as yet reached no final conclusion, and concerning which we invite your opinions—namely, how best to deal with condensation in the secondary flue, if and when it is sufficiently heavy to reach the baffler and cannot be disposed of by a suitable arrangement for draining the secondary fluepipe itself. The problem does not normally arise but it is sufficiently common to warrant consideration. As you will be aware, in certain types of baffler (*e.g.*, B.P. No. 305,809) any condensation is led by the vanes into the deflecting cup or cone and there re-evaporated. This method is very satisfactory when the cup or cone has good acid-resisting properties, but less so when cheaper materials are employed (*cf.* fig. 14).

Alternatively, condensation is allowed to drain into the interior of the appliance and there to re-evaporate. Apart from the increased corrosion of the appliance itself, unless the design of the latter has allowed ample space at the top for the building up of corrosion products this may lead to blockage of the primary flue.

A third method is to provide a condense rim round the skirt of the baffler (fig. 9) in which condensation is either collected and re-evaporated (since only in extreme cases is it continuous) or from which it is led by a suitable pipe to the condense tray or pipe of the appliance itself or to any convenient drain. Unless the materials of the baffler are very resistant to corrosion this rapidly leads to an unsightly appearance, but the most important feature of such designs is that usually the back pressure set up by the obstructing rim makes the baffler performance unsatisfactory. An interesting example is the baffler shown in fig. 10 which on test proved tolerable under down-draught conditions. The condense rim in this example was a circular trough attached only by lugs to the baffler skirt, and leaving a clearance to guard against the back-pressure effect. The clearance was, however, small and the possibility of its ultimately becoming blocked by corrosion could not be overlooked. It was therefore artificially sealed and further tests showed that in this condition the baffler was very unsatisfactory (fig. 10). It was



BAFFLER WITH CONDENSE RIM.

Fig. 9.

therefore rejected—a precaution which some may feel to have been extreme but which, in our opinion, was justified.

*Effect of Appliance on Performance of Baffler. Integral or Non-Integral Bafflers?*

We have already indicated several reasons why the performance of a baffler cannot be specified accurately except in relation to a particular appliance—*i.e.*, why a baffler may give good results on one appliance but not on another; others are given below:

(i.) The skirt of the baffler may be so close to the top of the appliance that the relief outlet of the baffler is thereby restricted. Fig. 11, showing the effect of the length of primary flue on the performance curve of a baffler fitted to a geyser, illustrates this point. Nevertheless, we urge the fitting of the baffler as close to the heater as is compatible with good downblow performance, insisting that the appliance itself should be so designed that with its baffler in this position it has an adequate margin of safety in combustion. If to pass the standard combustion tests a heater requires an appreciably greater length of primary flue than is necessary to provide adequate clearance for downblow between the baffler and the top of the appliance, it must be considered antiquated. Only with such an appliance can the recommendation of the N.G.C. booklet ("Instructions for Fixing Geysers," published in 1930 and now in course of revision) to the effect that "Wherever possible a length of flue pipe should be fitted between the geyser and the baffler" be

considered good practice. Once we recognize that an appliance is incomplete without its baffler we shall cease to discuss the tiresome question "Where should the baffler be fixed?" and concentrate on ensuring that the bafflers we supply as parts of our appliances are reliable in design and do not require impracticable length of secondary flue to ensure their normally clearing products.

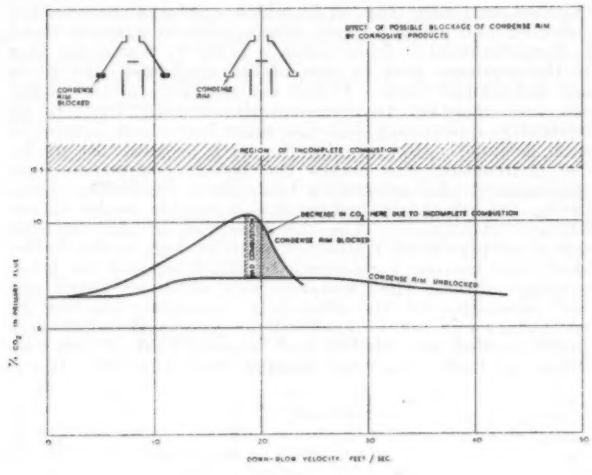

EFFECT OF POSSIBLE BLOCKAGE OF CONDENSE RIM BY CORROSIVE PRODUCTS
CONDENSE RIM BLOCKED
CONDENSE RIM
REGION OF INCOMPLETE COMBUSTION
DECREASE IN $CO_2$ HERE DUE TO INCOMPLETE COMBUSTION
CONDENSE RIM BLOCKED
CONDENSE RIM UNBLOCKED
% $CO_2$ IN PRIMARY FLUE
DOWN-BLOW VELOCITY. FEET / SEC.

Fig. 10.

(ii.) We show in fig. 12 downblow performance curves obtained with the same baffler fitted to (*a*) a geyser and (*b*) a wash boiler. It should be noted that the peak in the $CO_2$ curve present in (*a*) has entirely disappeared in (*b*). The effect was attributed to the building up of a static pressure on the floor at the base of the boiler, causing an increase in the ventilation through the latter.

(iii.) In fig. 13 the performance curves of a baffler fitted to a geyser are shown (*a*) under normal conditions, (*b*) with a flat horizontal plate placed midway round the body of the geyser. The abnormal peak occurring at high velocities in the former condition, which is quite apart from the usual form of the downblow curve, is attributed to a suction effect existing around the base of the appliance at the higher velocities.

(iv.) The volume and temperature of the products of combustion leaving the outlet of the appliance and the dimensions of the appliance itself influence the magnitude of the change in $CO_2$ which is produced by the addition

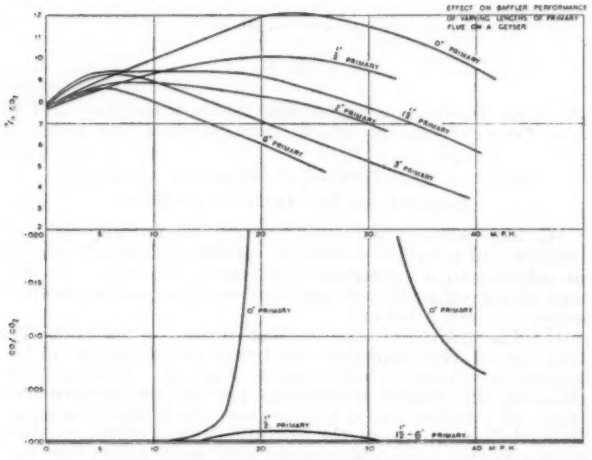



Fig. 11.

of any given baffler. Therefore a baffler which is satisfactory in respect of primary resistance when placed on one appliance will not necessarily be satisfactory when placed on another. For example, a baffler added to a certain geyser raised the $CO_2$ from 9·3% to 9·6%—*i.e.*, by 0·3%: the same baffler on another geyser raised the $CO_2$ from 6·8% to 7·7%—*i.e.*, by 0·9%. The decrease in the amount of air drawn through the first appliance was thus 3% and through the second 11%. The former decrease would not normally impair combustion seriously: the latter might.

## VII. GENERAL POINTS OF BAFFLER CONSTRUCTION.

### *Materials.*

We do not propose to say much about the materials used in baffler construction: clearly, so far as economically possible, the most corrosion resistant material should be employed, though other factors such as ease of working and good appearance have also to be considered. "Corrosion resistant" is a regrettably vague term, but, as you will realize, it is difficult to be precise in defining it in its present context.

For many domestic water heaters vitreous enamelled mild steel sheet has proved very satisfactory, and, together with enamelled cast iron for larger appliances, is in our opinion probably the best material available. Where its capital cost, reasonable though it is in relation to its life, is a serious obstacle to its use, it is worth considering how far the more vital parts of the baffler, such as the deflecting plate cup, cone, &c.), can be made in this or some other resistant material, the rest of the baffler being of cheaper construction (*cf.* fig. 14). So far as we are aware, little

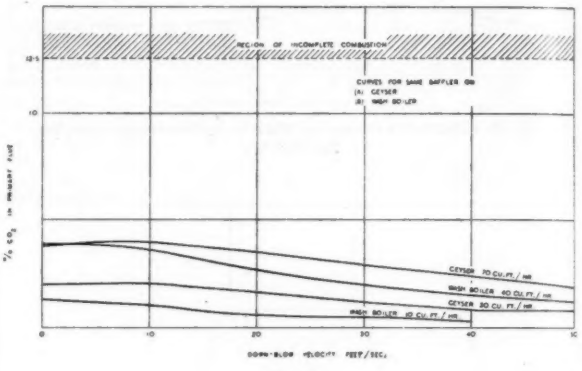

REGION OF INCOMPLETE COMBUSTION
CURVES FOR SAME BAFFLER ON
(A) GEYSER
(B) WASH BOILER
% $CO_2$ IN PRIMARY FLUE
GEYSER 20 CU. FT. / HR.
WASH BOILER 40 CU. FT. / HR.
GEYSER 30 CU. FT. / HR.
WASH BOILER 60 CU. FT. / HR.
DOWN-BLOW VELOCITY FEET/SEC.

Fig. 12.

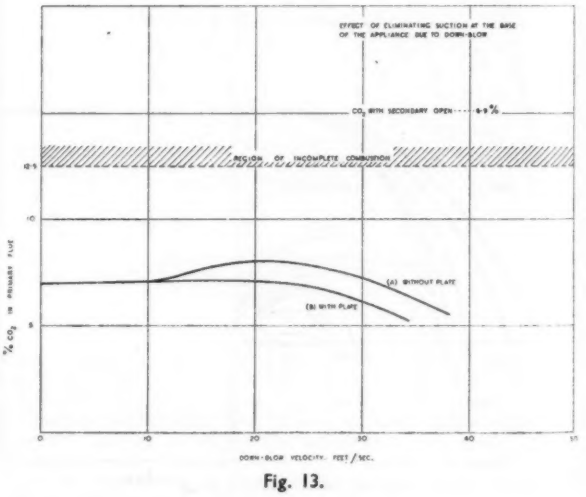

EFFECT OF ELIMINATING SUCTION AT THE BASE OF THE APPLIANCE DUE TO DOWN-BLOW
$CO_2$ WITH SECONDARY OPEN
REGION OF INCOMPLETE COMBUSTION
(A) WITHOUT PLATE
(B) WITH PLATE
% $CO_2$ IN PRIMARY FLUE
DOWN-BLOW VELOCITY. FEET / SEC.

Fig. 13.

information is at present available; it will certainly be necessary to bear in mind the possibility of electrolytic action between two dissimilar metals when the choice is being made. In our opinion no part of a baffler should be made in sheet iron protected only by a coat of paint, galvanizing after manufacture being an essential minimum treatment.

### *Heat Effects, Strength.*

It may perhaps be as well to point out that by corrosion resistant we mean not only resistant to atmospheric corrosion and to condensation, but also to the effects of hot dry products of combustion and air. As a minimum the materials chosen should be capable of withstanding for long periods the highest temperatures they are likely to encounter—*i.e.*, the flue gas temperatures of the appliances with which they are to be used. High temperatures may

not only cause the formation of oxide scales, which may easily fall off and restrict the primary flue, but may seriously reduce the mechanical strength of an originally strong baffler. Both phenomena have been encountered in practice and are covered by the draft British Standard Specification.

We would mention here, as a point of interest which may be unfamiliar to some of you, that we have come across bafflers which before and after prolonged use were adequately strong when subjected to forces acting along their major axis (*i.e.*, the normal direction in which the weight of secondary flue pipe acts), but which were liable to serious distortion if any sort of twisting force was applied, as might happen during the erection or removal of a somewhat tightly fitting piece of fluepipe. Conformity to British Standard dimensions for fluepipe connections[4] (sockets, spigots, clips, &c.), the desirability of which it should hardly be necessary to urge, reduces but cannot altogether eliminate the possibility of such tight fits, and it is as well to bear them in mind when designing or testing bafflers.

*Definite Lines.*

In concluding this section we urge that as a general principle bafflers should be designed so that the vital parts should be susceptible to easy and accurate registration with one another during manufacture and that so far as possible any indefinite curves, lips, &c., should be avoided. This is perhaps especially important in asbestos cement bafflers, some of which in the past have had lips of ill-defined shape as the primary means of deflecting downdraught. With clearly defined lines it is much easier for anyone to see at a glance if by mischance some damage has occurred or an error in manufacture has been made; while the mass testing of the bafflers for conformity to standard dimensions is appreciably simplified.

## VIII. CONCLUSION.

We hope we have been able to show that, while there still remain to be discovered interesting possibilities in the

Fig. 14.—Corrosion of Baffle Plate.

design and testing of bafflers, and a good deal of quantitative theoretical work (*e.g.*, on the theory of two converging streams of gas) which might be of great technical value, the general performance of bafflers and the desiderata for their satisfactory operation are clear. Opinions may differ as to the desirable range of test velocities, but there is at least one completely adequate yet simple method of testing the performance of a given baffler on a given appliance—viz., that involving flue gas analysis and velocity measurements.

It is surely no longer possible to maintain that there are any valid reasons other than the purely financial for supplying appliances* without bafflers, either integral with the appliances or sent out therewith as essential fittings. Even the financial objections raised are really invalid, since ultimately the baffler has to be supplied by someone and the customer has to pay for it. There is no inherent reason why a baffler supplied as suggested should be more expensive than one bought separately, and there is every advantage in knowing that whatever flue equipment is added to an appliance subsequent to its being sold, danger to the user and, at the very least, loss of prestige to the maker and gas undertaking cannot result.

* Other than those designed to be used fluelessly, of course.

It is satisfactory to find on the market a growing number of appliances properly equipped up to the point at which the secondary flue has to be connected. It is earnestly to be hoped that those makers who do not as yet regularly list and issue their appliances in this way will reconsider their position and responsibility, and that gas undertakings will encourage them in this policy.

Even in the most acutely competitive market there is no justification for evading the responsibility of doing our utmost to ensure the safety of the individuals using the articles we supply. We are convinced that in this cause manufacturers and gas undertakings alike will be willing to co-operate, given the opportunity. It is hardly our function to suggest how this desirable end may best be brought about, but if our Paper should in any way contribute to its attainment we shall feel amply rewarded for the time spent in its preparation.

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(*Discussion follows on next page.*)

# Discussion.

The PRESIDENT (Mr. R. Summerson, Luton), in opening the discussion, observed that this research had been necessary in order that they might have the best possible baffler, which would guarantee the safety of the appliance. It was interesting to note, however, that there had been attempts in the past to design systems which did without the baffler. It was not many years since some ingenious person first designed the balanced flue system—in which there was no baffler. Applied to a geyser, the idea was that the air for combustion was taken through a fluepipe from the outside atmosphere to the appliance, which was sealed from the room in which it was fixed. The waste products were taken to the outside atmosphere through a sealed fluepipe. The idea was that any wind there might be would blow equally upon the air inlet and flue outlet, so that the system was balanced; and whenever the gas was alight in the appliance the aerodynamic force of the warm flue gases was always sufficient to guarantee proper evacuation of the flue products. This principle was adapted and used in the Davis Balance Radiator, with which, no doubt, most of them were acquainted. Mr. Summerson had hoped that this idea was adaptable to water heaters, but he gathered from the Paper that there were practical difficulties. He would like, however, to express the hope that research would be continued in this direction.

Continuing, the President said that he felt a built-in flue should be provided in every room in the house, *including* the bathroom and kitchen. Such flues, properly constructed, could be expected to work efficiently—and gas appliances could be connected to them by short flue connections and *perhaps* without bafflers. In any case, such flues would very much improve ventilation in the kitchen and bathroom, which were usually the most damp and steamy rooms in the house. But the Authors wanted them on that occasion to discuss bafflers—and not how they might do without them.

## A Source of Amazement.

Mr. G. N. CRITCHLEY (Gas Light and Coke Company) remarked that the investigation forming the subject matter of the Paper completed a further page—be it of necessity at the moment only in draft—in the very exhaustive programme of work at present being undertaken by the Gas Light and Coke Company to ensure the safe utilization of gas, and it satisfied a long-felt want in the study and practice of ventilation. In the past, perspective relating to the danger arising in the utilization of gas had frequently been sadly awry, due largely to the activities of a sensationalist Press. Mythical monsters and versatile film stars had each had their moments in the public eye; but whereas even the most enterprising and elastic press reporters tired long ago frequenting the shores of Loch Ness and the keyholes of boudoirs, yet the moment the behaviour of a poor maligned geyser savoured in the slightest of indiscretion the headlines blazed forthwith. As between two of these possible points of vantage the choice might strike some of them as being a somewhat curious one, but still, there it was.

In what might be regarded as the previous Paper of the present series—that on "Gas Safety Precautions," presented by Mr. C. A. Masterman last year to The Institution of Gas Engineers—much was done to establish a rational perspective, and it behoved them in any consideration of the utilization of gas to memorize at least a representative sample of the facts presented by Mr. Masterman. It was shown, for example, that, over a period of four years, the number of deaths caused by persons falling downstairs was more than four times as great as that attributed to accidental poisoning by town gas, and that, statistically speaking, more danger arose from travelling a single mile in a motor car than from using a gas appliance throughout its entire life. Deaths attributed to products of gas combustion amounted only to some 0·04% of the total violent deaths reported annually by the Registrar-General. Although on a statistical basis they were clearly very few and far between, accidents did occur in utilizing town gas, and he was in full agreement with the opinions expressed in the Paper as to the part improved baffler design was capable of playing in effecting a further reduction. In three of the five tangible cases occurring over a period of three years on the area supplied by the Gas Light and Coke Company in which products of combustion were involved, defective bafflers were major contributors. A belief widely accepted, not only by the uninitiated, but even by the relatively enlightened, was that an efficient terminal should, in itself, be capable of preventing downblow. Indeed one authoritative body had recently drawn up regulations to the effect that geyser flues must be provided with terminals capable of preventing downblow. The only terminal which could adhere to this particular letter of the law, observed Mr. Critchley, was a cork! The possibility of downblow being inherent in any terminal which they were capable of producing, this downblow must be prevented from reaching the burner and creating dangerous conditions. If diversion of downblow were the only factor determining the design of a baffler, then a sufficiently large baffle plate and adequate relief outlet would ensure that the downblow had no practical effect in the primary flue.

## Cost and Appearance.

In practice, cost and appearance were factors which required that the baffler should be as small as is compatible with good performance. Fig. 4A showed the performance of a good practical baffler. It was seen that high up-draught velocities created a suction which caused excess air to be drawn into the appliance, which excess air caused the $CO_2$ content of the primary flue gases to be lower than at normal aeration. As up-draught velocities were reduced, the proportion of excess air per cubic foot of gas burned fell, until, when there was neither up-draught nor down-draught, the $CO_2$ content of the primary flue gases was about 1·3% higher than when the up-draught velocity was 30 m.p.h. On now inducing a down-draught, the $CO_2$ content of the primary flue gases further rose until, at a down-draught velocity of about 12 or 13 m.p.h., the $CO_2$ content of the primary flue gases reached a maximum at about 1·7% higher than when the up-draught velocity was 30 m.p.h. On further increasing the down-draught velocity, the $CO_2$ content of the primary flue gases fell until, at about 30 m.p.h., it dropped below that of the perfect baffler. It was stated that the performance of no practical baffler approached at all closely that of the perfect article. The suggestion might or might not have a practical application, but as a matter at least of theoretical interest it would be interesting to know if Messrs. Legg and Noble had carried out tests with two closely contiguous bafflers operating in series, or, what amounted to the same thing, of a composite baffler having two distinct baffle plates and two distinct relief outlets. It would appear, at least on cursory inspection, that such an arrangement would be capable of approximating the ideal straight line performance.

It was interesting to observe, continued Mr. Critchley, that the peaks of the $CO_2$ curves both for good and bad bafflers occurred at relatively low draught velocities. It was clear that factors other than the velocity of the prevailing wind would determine the possible down-draught velocity; but the information given in figs. 4A and 5 suggested that the least safe conditions did not necessarily occur in the worst weather. Perhaps the Authors would care to throw further light on the relationship between prevailing atmospheric conditions and down-draught velocity.

It would appear—and here Mr. Critchley hoped the Authors would correct him if he was wrong—that if fig. 5 portrayed the performance of an actual baffler it would refer to the type of bad baffler in which the space between the top of the primary flue and the baffle plate or relief outlet was restricted. The indication that this was so was the fact that the $CO_2$ content under static conditions was apparently higher in fig. 5 than in fig. 4A. It would be interesting to know if the Authors had tested a baffler which had an adequate space between the top of the primary flue and the baffle plate and an adequate relief outlet but a much undersized baffle plate. In this case one would expect that the $CO_2$ content of the primary flue gases would be the same as in the case of the baffler the performance of which was illustrated in fig. 4A, that the peak of the $CO_2$ curve would occur at lower down-draught velocities than in the case of a good baffler, and that the slope of the $CO_2$-draught velocity curve would be greater on both sides of the maximum. If that be the case, then the position of the peak in the $CO_2$ curve would, among other criteria, be an indication of the quality of the baffler.

Incidentally, the Authors had chosen 8% as being the ideal $CO_2$ content of the primary flue gases. Although it was made clear by Mr. Noble in his commentary that 8% was not the optimum for all appliances, it would be interesting to know what determined its choice in that particular case. On its face value it would appear to be somewhat low for appliances of modern combustion standards, and to entail an unnecessary loss, however small, of thermal efficiency as compared with as high a figure as was consistent with the limiting $CO/CO_2$ ratio.

The recommendation that a baffler should be provided as an integral part of the appliance for which it had been designed, went on Mr. Critchley, was indisputably sound. All too frequently one encountered on the district appliances which in themselves were reasonably good, but which were connected to very inferior flue equipment. Until the day dawned when this recommendation would be universally effective, the supply of flue equipment by builders' merchants and others would continue, and information such as that given in the present Paper should be made available to such factors and to the manufacturers from whom they obtained their supplies.

The Authors had stated that bafflers with restricted relief outlets, as in the so-called "cage" type, were seldom encountered. Mr. Critchley's own recent information, however, showed that their occurrence on the district certainly could not be described as rare, and that district personnel should keep a vigilant eye open for such bafflers and should endeavour to have such as they found replaced by approved equipment. It was a little perturbing to find that the Authors classified bafflers into but three categories—the very bad, the bad, and the good. By inference one would gather that their classification of the contributors to the discussion would allow of no category between the definitely bad and the definitely good. This was all the more disquieting when one felt that the last word one had to say might serve greatly to strengthen the riposte. It was concerned between the relationship between the static pressure in the primary flue and the down-blow pressure. Without a complete understanding of the physical significance of the constants $a$, $b$, $c$, and $d$, it was, of course, unreasonable either to criticize or unreservedly to accept the relationship tentatively advanced. From a mathematical point of view, however, the equation did pull one up—at any rate on

first reading. The numerator was quite normal, but the necessity for a constant in the denominator did seem curious. If $d$ were to disappear, then the equation would be simplified into an expression in terms of the first power of $x$. The reserve expressed by the Authors in advancing the equation clearly indicated that it would be unfair, in its present stage of development, to ask for a full explanation of the relationship; but if they would care to give some indication as to the reason for a constant addendum to $x$ in the denominator, then the relationship would become more tangible. Perhaps, however, in actually making the riposte, the Authors might see their way to strain the quality of mercy in the light of the fact that one hurried reading of even so comprehensively presented a Paper was by no means adequate for its complete assimilation.

## Varying $CO_2$ Figure.

Mr. NOBLE stated that the graphs shown were not intended to suggest that 8% was an ideal carbon dioxide content. It could vary according to the particular appliance. Mr. Critchley had suggested that 8% was a low value, but Mr. Noble considered that it was actually a high value for many appliances; there were many working at 6% which would give a thermal efficiency of 80%. The carbon dioxide value alone did not determine the thermal efficiency. He was sorry to hear that the cage baffler was still to be found on the district. They did not find this type coming in for test to-day. As to the three categories, "very bad," "bad," and "good," implying that there were more bad bafflers than good, he said that nowadays the good baffler preponderated so far as those coming in for test were concerned. The three categories were purely arbitrary distinctions. Watson House set a definite standard of performance, and any baffler which did not conform to that was regarded as bad. Many bafflers which they just called "bad" were not visibly bad and did not appear bad until they applied the carbon dioxide test. They had checked their equation in several instances, and whether it was actually right or wrong mathematically it gave surprisingly good agreement over a number of tests.

Mr. C. W. ISARD (of Cellactite and British Uralite, Ltd.), in a written contribution, stated that the Paper dealt with a subject which, in their intention to co-operate and to respond to opinion in the Industry, was always before his Company and himself; and that co-operation would be real in any practice which was adopted as a result of their discussions. In this spirit he would like to contribute a word or two to the question raised where asbestos cement bafflers were mentioned in the Paper. In his experience he had encountered very few service examples having the fault described; and although he did not deny the occurrence of others on that account, it was, he thought, of help to say that these had always been traced to individual faults coupled with careless inspection before despatch rather than to any limitations of the material itself. Moreover, the despatch and use of hundreds of thousands of bafflers over a period of fifteen years without a single fatal failure within their knowledge was evidence that general baffler design was well within the scope of asbestos cement. Nevertheless, manufacturers wanted to move with the Industry towards improvement, and his Company was at the present time giving attention to methods by which bafflers could be made up in one piece, thus cutting out the slightest risk of deformation in assembling two or more parts. The simpler the design the quicker their success in this. Before writing, said Mr. Isard in conclusion, he had conferred with his friends, the Turners Asbestos Cement Company, who united with him in expressing the views he had expressed and in the attitude of keen response to requirements in the Gas Industry.

Mr. F. C. KERRY (of Turners Asbestos Cement Company), in the course of a written contribution, raised a point in connection with the paragraph of the Paper headed "Definite Lines." They always did their best, he observed, to co-operate in every way with the Gas Industry, and he thought they would agree with him that "efficiency" had always been their watchword. Nevertheless, there doubtless had been cases, particularly in the early days of manufacture, when asbestos cement bafflers were not all that they might have been. However, during the whole period during which his firm had been producing these bafflers he had never known of a single instance of fatal failure—and he thought it was fairly certain that had one occurred they would have heard about it. Where the disadvantages mentioned in the Paper occurred he thought that at the present time they were rather due to occasional careless inspection as a result of human fallibility than to any bulk production of asbestos cement bafflers with lips of ill-defined shape, &c. He trusted the Authors would forgive this criticism. It was, of course, their desire to move forward with any improvements suggested by the Gas Industry, and during past years they had gone very carefully into the question of bafflers—and he believed that Mr. Stone (of his firm) had sat with Mr. Noble on the British Standard Specification Committee which defined a standard for these articles.

Mr. NOBLE said that in the past some asbestos cement bafflers had been designed with ill-defined lines, though many had been modified and approved by his own Company. There were, however, bafflers in which the means of diverting the down-draught was something in the nature of an ill-defined lip, looking as if it had been put on at the last moment. In the routine testing of such bafflers, it had to be decided whether this was right or wrong—and it was difficult to tell from appearances. The general design of asbestos cement bafflers was now in the direction of simpler lines. Vitreous enamel finished bafflers were, however, generally preferred from æsthetic reasons. There were various grounds for the views they had expressed in this connection—which were only personal opinions.

## A Baffler is Necessary.

Mr. G. EWART (of Ewart & Son, Ltd.) remarked that it was generally agreed by those responsible for the fixing of apparatus that a baffler was necessary, and his firm used to make this clear in the instructions which accompanied the appliances. In spite of this, however, bafflers were not always fitted; and this Paper therefore served a useful purpose in drawing special attention to the importance of the baffler. In the past attention had been directed rather to the apparatus itself, and the baffler appeared to be regarded as of secondary importance. He was particularly interested in the question of dealing with condensation, and his firm had made special provision for this. A point which had to be considered in this connection was to allow sufficient width for the hood; this was very important. But another point was the appearance of the heater, and there had been criticism of their apparatus on the score of ugliness, appearance being a strong selling point. But efficiency must come before appearance. One of the illustrations showed a condensation tube taken from the baffler plate. But it seemed to him that with such an arrangement there was a risk of the products of condensation dropping on to the top of the heater if they were not first evaporated, which would result in a green stain on the side of the appliance or on the floor. Mr. Ewart observed that he was in complete agreement with the remarks of the first speaker when he stated that the provision of the gas water heater should be regarded as much an integral part of the bathroom or kitchen as the open fireplace was in the living-room. It was a matter of educating builders and architects on these lines. He had also referred to the balanced method of ventilation and expressed the opinion that this might be tried with water heaters. Why the idea had not already been proceeded further with Mr. Ewart did not know. He considered that the crux of the whole Paper lay in the suggestion that there was no such thing as a "general purposes baffler" in itself. He fully agreed with this; the baffler should be designed, made, and supplied by the manufacturers as part of the particular apparatus.

Mr. NOBLE observed that he was aware that what Mr. Ewart had said had been the policy of his firm for some time past, and he was sure it would continue increasingly in that direction. He had referred to the recommendations set out on the instruction cards for fixing bafflers. Nevertheless, he knew of instruction cards accompanying heaters recently submitted for test which merely stated that bafflers must be fitted if a down-blow occurred. That, of course, was perfectly true; but it probably meant that there would be one person less in the world when it had been fitted. It was vital that the performance of the appliance should have first consideration, and in the Paper they had mentioned appearance as incidental. Nevertheless, it was possible to combine good performance with good appearance. The tube leading from the baffler plate did not just allow the condensation to drip on to the top of the appliance. He imagined that it was led away to a more suitable point. But he did not consider this to be necessarily the best method of dealing with condensation.

Mr. L. FRIEDMAN (of Ascot Gas Water Heaters, Ltd.) said he considered the name "baffler" a misnomer, as the object of this piece of apparatus was to divert down-draught from the combustion chamber, allow easy egress of the products of combustion from the combustion chamber when static conditions prevailed in the flue, and divert the intake of secondary air drawn in by the flue from the combustion chamber to the hood of the draught diverter. He suggested, therefore, that a more suitable name would be "draught diverter," which, as it happened, was mentioned in the Paper. Another suggestion Mr. Friedman had to make was that the more correct definition of "primary" and "secondary" resistance was the "inlet" and "outlet" resistance of the draught diverter. These expressions could equally well be applied to other apparatus and formed a useful specification of performance. Mr. Friedman regretted that not sufficient stress was laid on the function of the baffler when static conditions were present in the flue. He pointed out that it was these circumstances that had the greatest element of danger arising from air vitiation, whereas if down-draught was present the products of combustion returning into the room were diluted with fresh air. Thus for a room measuring 8 ft. by 8 ft. by 10 ft., where an appliance consuming $3\frac{3}{4}$ cu.ft. of gas per minute was installed, air vitiation to an undesirable degree would occur in ten minutes. If a back-draught of a velocity of 3 ft. per second were present in the flue measuring $4\frac{1}{2}$ in. internal diameter, the fresh air entering into the room would be 25 cu.ft. per minute which would be sufficient to counteract any tendency towards air vitiation. It was, therefore, most important to ascertain that the design of the draught diverter was such that if the flue was accidentally blocked or thermal static conditions prevailed the smallest resistance possible was offered to the free egress of the products of combustion.

Mr. Friedman did not agree that devices for reducing the gas rate in the case of back-draught need necessarily be a nuisance. As explained in his Paper given before the London and Southern District Junior Gas Association on Dec. 12, 1936, a back-draught safety device could be designed so that the gas rate was only reduced if back-draught or static conditions persist for some minutes; thus intermittent back-draught and static conditions would not affect the operation of the heater. Mr. Friedman stressed the following statement in the Paper: "Each appliance should be definitely associated with a particular baffler, either as an integral part, or listed as an essential fitting not to be replaced by something else 'just as good,' any necessary

primary flue being incorporated in the appliance and/or baffler." He pointed out that it had been the practice of the firm with whom he was associated to supply heaters with integral draught diverters for the last ten years. Regarding the President's remarks concerning built-in flues, Mr. Friedman pointed out that Dr. Bernard Friedman had stressed the necessity of this in a Paper given in Manchester some years ago and considerable progress in this direction had already been achieved.

Regarding the suggestion that inlet resistances of draught diverters should not exceed 2 ft., Mr. Friedman pointed out that although this figure might be tolerated from a theoretical point of view, in actual practice it would be very inconvenient to adopt it owing to the modern tendency to build houses with low rooms. Most installations contain a bend taken straight from the draught diverter through the wall and terminated by means of a ventile, which made the 2 ft. vertical rise necessary to overcome the inlet resistance impracticable.

## Cross-Channel Terminology.

Mr. NOBLE said that so far as terminology was concerned he continued in practice to use the word "baffler." It was not such a bad term and was generally understood. "Draught diverter" better expressed the function of the baffler, but was longer—although not so bad as "Zugunterbrecher mit Ruckstromsicherung" used on the other side of the Channel! He was inclined to agree with what had been said in regard to primary and secondary resistance; they should perhaps preferably be called inlet and outlet resistance. They had, however, stated in the Paper that the terms had been used somewhat loosely. The first section of the Paper admittedly did not describe what the "perfect" baffler should be. That section was rather a general discussion after which they went on to the question of what a perfect baffler should do. He agreed that static conditions were most dangerous. Nevertheless, the ultimate test must be a statistical one. They had given in the Paper some indication as to why accidents did not occur. Mr. Friedman had rather emphasized accidents due to static conditions, but he was careful to state that they occurred outside this country. This point was significant because combustion standards in this country were higher than abroad. He doubted if he really thought that a 2 ft. flue for clearance of products was tolerable; it was an absolute outside limit, as had been indicated in the Paper. The increased $CO_2$ was not due to the cause suggested by Mr. Friedman but to a definite suction effect.

Mr. T. G. BROOKS (of Thomas Potterton (Heating Engineers), Ltd.) said that his firm provided certain of their appliances with bafflers, but they had received indications that it was desirable for them to go more closely into this question. Many of their appliances had very high outputs. The President had raised the subject of the balanced flue, and his firm had had heaters working for many years past under this system. They had also installed a large number of boilers in enclosures in which balanced conditions prevailed. These were enclosed constructions in the wells or areas of large buildings, and they had functioned very successfully. In certain instances they led a fluepipe from the top of the enclosure, but these flues were not directly connected with the boilers themselves. The enclosures had air inlets near the floor, and the appliances vented directly into the interior of the construction, the products being finally vented through the roof. If the fluepipe were connected directly to the heater the installation would not pass the L.C.C. regulations. They found that the secondary flue gave the greatest trouble. He was sure that the Authors would agree that the baffler should not discharge the products of combustion into the room, but rather into the open air. Mr. Brooks had seen cases of additional bafflers fitted *outside* the building, which had overcome down-draught trouble.

Mr. NOBLE observed that he was glad to hear that Messrs. Potterton were considering the question of supplying integral bafflers. He knew that they were already doing it on certain appliances. The construction of balanced enclosures for the apparatus was interesting; he had heard of this system, which appeared to be a very good proposition for larger appliances. There were many terminals one might observe which might be giving an up-draught; but nobody could be absolutely certain of this, and although they might work satisfactorily for long periods, there was always the chance that down-draught might occur to smother the appliance, unless a baffler were fitted in the same room as the appliance.

Mr. BROOKS added that in the case he referred to a baffler was also fitted inside, and Mr. NOBLE agreed that in that case all was well.

## Importance of the Terminal.

Mr. W. L. WESTBROOK (North Middlesex) expressed the opinion that the question of bafflers should not be separated from that of terminals. The two must be considered together. There were far too many terminals which allowed heavy wind pressure to get back to the baffler. He himself had an instance of a heater operating at 180 cu.ft. per hour being completely extinguished when the wind was in a certain quarter. On another occasion a heater fitted with an integral baffler had been extinguished. Moreover, the position of the terminal should be considered when dealing with this question. There were types of terminal which made it very difficult for the products to escape. Mr. Westbrook asked why they limited the test to a wind velocity of 60 m.p.h. Wind velocities often exceeded that figure, and he considered that they could not reproduce the conditions of nature by that method, because on windy days they frequently experienced a lull followed by a severe gust—which was very different from a steady draught. He suggested that tests be carried out utilizing a cut-off in order to study this point. He thought it possible that the trouble in his own case, to which he had referred, might have been attributable to such causes. He would like to support the appeal for further investigation of the balanced flue. It was possible that the gutter to which reference had been made might exert a slight back-pressure against down-draught. It had also been stated that the bottom of the hood should be at least level with the top of the primary flue. He always insisted that it should come lower, so that in cases of only very slight down-draught the hood might prevent the products from entering the room.

Mr. NOBLE observed that the actual point at which the products escaped did not matter very much. There were various reasons for smothering; the most probable was that the baffler was fitted too close to the appliance. It depended entirely upon the particular appliance whether 6 in. of primary flue was or was not sufficient. Secondly, the baffler may have become damaged in some way. The fact remained that if the appliance was extinguished the particular baffler referred to, fitted as it was fitted, was simply not a good baffler. Mr. Noble considered that one could reproduce the conditions of nature in the laboratory. He agreed that in practice down-draught was intermittent, and they had shown a curve specially to indicate that. Although he admitted that they had not carried out any tests with an interruptor, he was confident that the general results would be the same. Nevertheless, this was an interesting suggestion, and he would like to follow it up. In any installation where the flue outlet was exposed to one gust or a steady wind the flame could be extinguished at full gas rate and yet remain burning at a low gas rate or on by-pass. This was explained by the fact that at low gas rates almost pure air was being blown across the flame, which did not hinder combustion. At high gas rates, on the other hand, the flame was put out by chemical extinction. Their views on the subject of balanced flues had been more or less stated in the Paper; it was difficult to be absolutely certain that any balanced flue device would work. The main objection was the complication of the appliance and the difficulty of maintenance. The skirt of the baffler was to ensure the proper exit of the products; the deeper the skirt the more liable was the baffler to fail under downblow. One must endeavour to strike a balance between this and protection from cross draughts.

## Vote of Thanks.

The SENIOR VICE-PRESIDENT (Mr. R. N. LeFevre, Gas Light and Coke Company), in proposing a hearty vote of thanks to Mr. Legg and Mr. Noble for their Paper, quoted an extract from the *Evening Standard* which reported the proceedings at a recent inquest. Distorting the names for obvious reasons the extract was as follows:

> **"Bird Kills Boy in Bath.**
>
> The next witness was John Bloggins, an inspector employed by the Blanktown Gas Company. He stated that he had examined the fluepipe and found, in the flue terminal, a large bird's nest which completely blocked the outlet. In his opinion there was no doubt this was the cause of the fatality."

With all due respect to Mr. Bloggins, said Mr. LeFevre, with the information at his disposal he had no grounds for such a statement. One might well say:

(1) If the flue outlet was blocked the baffler should, for the short time the heater was in use, have permitted combustion to have continued unimpaired.
(2) If no baffler were fitted, what was the gas rate?

Mr. LeFevre thought he was correct in suggesting that, in this instance, the trouble was not due to the blockage; neither was it due to the baffler. It was due to a combination of circumstances, the chief of which was the fact that the gas rate was excessive. There was generally too great a tendency to blame the flue equipment and appliances while, all too often, the point of paramount importance—the gas rate—was overlooked. As the Author of certain popular works on the subject, Mr. LeFevre was frequently asked to justify his statements on baffler location in regard to its variation from the National Gas Council's recommendations in the Booklet on Fixing Geysers. Mr. Noble and Mr. Legg had done him a great service on that occasion by clearing up this controversy for all time; and if manufacturers of water heaters in general would follow the policy of certain enlightened manufacturers in particular, he would be saved considerable time in answering that old question: "Where shall I put the baffler?" Little doubt should now be entertained that the baffler should be designed to suit the particular appliance and be supplied integral with it. The thanks of the Association were due to Mr. Noble and Mr. Legg for the excellence of their Paper and the care and hard work which its preparation had involved. He therefore had the greatest pleasure in proposing that the meeting accord them a hearty vote of thanks and wish them every success in their future efforts.

The JUNIOR VICE-PRESIDENT (Mr. S. C. Waldock, Gas Light and Coke Company) seconded the vote of thanks, which was heartily accorded, and briefly acknowledged by Mr. LEGG.

# Sidmouth Council Seek New Site for Gas-Works

Board of Trade Enquiry

**Discussions, projects, and controversies extending over a period of about two years as to the best means of overcoming the inadequacy of Sidmouth's present Gas-Works were brought to a head on Thursday, Jan. 21, when a Board of Trade Inspector opened an Enquiry into the Council's application for a Special Order under the Gas Undertakings Acts, 1920 to 1934, to empower them to purchase land for gas-works purposes near Sidmouth railway station. The existing works are close to the sea front.**

A body of objectors, about one hundred in number, including many property owners and occupiers from the neighbourhood of the proposed site, signed a petition against the proposal of the Council, alleging that the scheme would prove detrimental to a residential district.

The Enquiry was conducted by Mr. J. F. Ronca, Director of Gas Administration to the Board of Trade, and the Promoters of the Special Order—*i.e.*, Sidmouth U.D.C.—were represented by Mr. Jacques Abady, K.C., and Mr. H. Royston Askew, instructed by Messrs. Michelmore & Davies, of Sidmouth. Objectors to the scheme were represented by Mr. H. Heathcote Williams, Barrister-at-Law, instructed by Mr. H. A. Phillips, Solicitor, of Finsbury.

Mr. ABADY said the Special Order had three objects, the first being the authorization of the acquisition by agreement of the lands described in the first schedule, the second being to authorize the manufacture and storage of gas thereon; and the third was to extend the limits within which the Council were authorized to supply gas, so as to include that land which had been added to the Sidmouth Urban District by the Devon Review Order, 1935. The Council further desired power to borrow the money for the purposes of the Order and the Gas Undertaking. He suggested that before proceeding with the Enquiry the Inspector might like to inspect the proposed site.

Mr. HEATHCOTE WILLIAMS said he agreed to the latter suggestion, but first wished to lodge a formal protest as to the action of the Clerk to the Sidmouth Council in communicating with certain individual objectors, who were represented by a solicitor, in order to ascertain from them certain information.

The objectors' solicitor wrote to the Clerk on Jan. 16, stating: "I am informed by my clients that you have been instructing representatives on your behalf to interrogate several of the signatories to the petition presented. It seems to me that as they, or some of them, will probably be called as witnesses, it has been, if actually done, a wholly improper proceeding upon your part and contrary to all rules of procedure in controversy. I must ask that no further communication of the nature shall be made, and you may understand that a serious protest will be made to the Inspector on the matter at the Enquiry. I should not have thought it necessary to remind you that if there was any information which you considered you ought to have from the objectors for the presentation of your case, the proper proceeding was to apply to the solicitor acting on their behalf."

In reply, the Clerk wrote: "It is quite true that my Council have made certain enquiries of various tenants of houses within 300 yards radius, and possibly some of them have been signatories to the petition you sent in, but I think on enquiry the individuals of whom enquiries were made will tell you that nothing has been said to them as to their attitude with regard to the proposed removal of the gas-works. My Council are quite prepared to meet any protest which you may care to have made at the hearing with regard to these enquiries, and to meet the fullest investigation into any action they may have taken in connection therewith. May I say that I was unaware until now that you were acting for all the objectors to the Council's proposals?"

Mr. Williams remarked that it must have been clear to the Clerk that the solicitor instructing him (Mr. Williams) was acting for a large number of objectors because the list was sent to their Parliamentary Agents. It was an improper course to adopt, and if it appeared that some of those people communicated with were Council tenants it would suggest that the Council was attempting to intimidate some of the objectors in the case.

Mr. Abady was asked by the Inspector if he wished to comment upon that matter, but said he did not see that it had anything to do with what the Inspector had to decide at that Enquiry.

## Necessity for a New Site.

After the Inspector had visited the site, Mr. ABADY said he would first endeavour to justify the necessity for finding a new site for the manufacture and storage of gas, and would then submit that the site chosen was an eminently suitable site, and that the proposals in the Order ought to be authorized.

The Sidmouth Council became the owners of the undertaking of the Sidmouth Gas and Electricity Company by the Sidmouth Urban District Council Act of 1912, one section of which defined the limits of supply as the urban district. That limit was extended by an order in 1925 to include Sidbury and Salcombe Regis, and in the present Order they sought to extend the limits to include certain portions of the two parishes of Harpford and Otterton. The price authorized by the Sidmouth Gas Purchase Order was 17·4d. per therm, but, in fact, they were charging far short of that amount, the price being 14d. per therm and 14·87d. for prepayment. Discounts were also allowed.

Referring to the existing gas-works, Mr. Abady said he was quite serious when he said that he could only describe them as "gas-works" by courtesy, and that it was not very courteous to the Gas Industry to call them gas-works. The present site was 1 acre and 30 perches in extent, but was intersected by a road which sensibly diminished the usefulness of the two portions. The works were now situated on the sea front, and in addition to having the characteristics he had described, they also had a further unusual qualification for unsuitability in that they were well below sea-level, and had from time to time been subject not only to serious flooding by the water washing over the front, but also by percolation or seepage through the shingly underpart of the front which had had from time to time a seriously detrimental effect to the foundations of the works. Some remedial work had stopped further trouble in that direction, but it had not been possible to repair the damage that had been caused to the foundations of the retort house particularly by the percolation.

The inadequacy of the present site had been a pressing question for many years, being first brought to the notice of the Council in 1927, and seriously considered by them from time to time since that date.

There had been a certain amount of local feeling about the whole matter, and accordingly the Council felt that the evidence to be put before the Inspector from the Board of Trade should so far as possible not be the evidence of anyone who had any local interest. They had therefore engineering evidence, which had been obtained from Mr. S. E. Whitehead, of Southampton, who had viewed the present works and the proposed site, and had gone into the question of lay-out and estimates. His evidence was quite external and impartial.

## Capacity Grotesquely Inadequate.

The maximum amount of gas that the present retorts could produce was 200,000 cu.ft. per day, but it was not fair to the management of an undertaking to reckon the carbonizing capacity at the full measure of their retorts. At least one bed should be put aside, which gave a capacity of 150,000 cu.ft. per day. There was in addition a small water gas plant, but it was highly undesirable that the general supply should rely on the water gas plant, and that there should be such a small amount of plant for gas making from coal. There was no margin at present to allow for repairs or renewals to the apparatus. The present retort beds were old, and it was not economic to renew them. The capacity of the works was really grotesquely inadequate.

Referring to storage capacity, Mr. Abady said there were two gasholders of 72,000 cu.ft. and 18,000 cu.ft. respectively, giving a total storage of 90,000 cu.ft., comment on which was unnecessary.

Mr. Abady went on to say that he had been advised that there were in Sidbury approximately 250 houses which would be consumers if the new works were carried out and the mains laid on. The Council had not previously supplied Sidbury, although the extensions could be done for a comparatively small amount. That made a total of 684 fresh houses which could be supplied in the future, representing an average increase of 20%, and an extra demand which could be created for at least 10 million cu.ft. estimated on a conservative basis. The necessity for the removal of the works, therefore, became more pressing.

Mr. Abady said he would show that the Council had not taken a short cut in arriving at their present scheme regardless of public interest of which they were the guardians, or of the well-being of the Gas Undertaking which they administered. Ever since 1927 they had been making efforts to deal with the situation. The condition of the retorts was considered, and in 1927 the Ministry of Health sanctioned a loan for the installation of a carburetted water gas plant as a stop-gap. The question of increased storage capacity was also considered in 1927 and after, and in October, 1932, the desirability of removing the works to a site near the station was considered. Enquiries were made, but no land was available which in the opinion of the Council and their advisers was suitable, and that had the necessary feature of being near the station or the railway.

On Jan. 14, 1933, the Council decided to go ahead with the

construction of an additional gasholder having a capacity of 25,000 cu.ft. There was a great deal of local opposition, as it would have meant putting the holder almost on top of the houses surrounding the gas-works. In consequence of that local agitation, the Council decided to limit the height of the holder to 60 ft., thereby reducing the capacity to 119,600 cu.ft. An enquiry was held on Oct. 1, 1933, following which the Ministry's Inspector made certain observations in a letter to the Council.

The parts of the letter read by Mr. Abady stated that the Inspector was advised that the storage capacity of the proposed new gasholder was much smaller than circumstances demanded, and the site was so restricted as to make the scheme very undesirable. The Ministry were accordingly unable to sanction the loan, and advised the Council to give the matter further consideration with a view to the submission of fresh proposals.

The Council considered that from the point of view of the amenities of a place like Sidmouth there would be strong objections on public grounds to reconstructed works on the sea front. It was really necessary to find a new site.

In the proposed scheme the Council were to be bound by certain conditions in the conveyance. Trees would have to be planted on the boundaries, so as to screen as far as possible from public view the works to be erected there. The works should be so placed as to be inconspicuous to the property in the neighbourhood, and should be managed in such a way as to prevent any nuisance, noise, or annoyance to occupiers of adjoining properties.

The Council had now investigated the matter, and said that not only could the scheme be carried out without an increase in the cost of gas and without any charge on the rates, but when the scheme was completed and the works were in action and the old site released, in proportion to the fulfilment of the view that they took as to increased demand, there would be great probability of a decrease in the cost of gas by about 1½d. or 2d. per therm.

The objection of those living near the proposed site was very natural, but he contended that the anticipated detriment to their property only existed in their imagination. Only a few of the objectors would be able to see the works or be aware of its existence.

When the Enquiry was resumed after lunch Mr. Abady said a letter of protest had been received from Mr. J. R. Holmes, complaining that the scheme would spoil the entrance to a seaside resort like Sidmouth.

Mr. W. J. Granger, in another protest, stated it was not an economic proposition practically to scrap the existing works with a present outstanding loan, and borrow £47,000 to build new works.

Mr. L. Field had sent a letter of protest against proceeding with the scheme until the possibility of obtaining the town's gas supply from an outside source had fully been explored. Further, he said the competition of electric current was such as to warrant caution before such heavy expenditure was contemplated.

Mr. Abady then produced correspondence from the Exmouth and Exeter Gas Companies, showing that they had been obliged to state their inability to afford a bulk supply to the town of Sidmouth.

## Mr. S. E. Whitehead's Evidence.

Mr. *S. E. Whitehead* (Engineer, General Manager, and Director of the Southampton Gaslight and Coke Company) said he was engaged by the Sidmouth Council early in 1936 to report on the condition of the present works, the possibility of extending and modernizing them, and the question of their removal. He found the carbonization plant in a bad condition and having insufficient margin for safety. The gasholder capacity revealed a very dangerous position, there being only about one-third of the required capacity. It was urgently necessary to tackle it a year ago. He had viewed the four sites, and recommended the proposed one near the station. He advised a continuous vertical retort as being most economic and cleanest, and two spiral-guided holders of 150,000 cu.ft. capacity. A rough estimate of the cost of the scheme was £49,000, the total annual loan charges at 3¼% being £2,317, or at the present output 1·74d. per therm.

He estimated the saving on the cost of making gas with the new plant at £1,902 per annum, which was over 1½d. per therm, based on actual figures for the past year. £360 would be saved on transport, and the annual revenue from the old site was estimated at £350, making a total of £2,612 a year saving effected by the transfer to the new site. The annual loan charge of £2,317, *plus* £37 for water supply, making £2,354, would give, therefore, an estimated net balance of saving on the basis of existing output per annum of £258.

In answer to Mr. Abady, witness said it was not suggested that they would not have to continue paying the existing loan charges.

This concluded Thursday's hearing.

## SECOND DAY.

The Enquiry was resumed on Friday, Jan. 22, when Mr. *Charles Lee Wright*, Surveyor and Valuer, of Exeter, said he was instructed by the Council to consider what effect the erection of the gas-works would have on property in the vicinity. He gathered that the site had been used as a brick yard. There had been excavations over more than an acre, giving a level site in a kind of hole, with a dense plantation of trees northwards. It was now used as a builder's dump. The rest of the site was agricultural land, but the possibility of development there was very remote, if not impossible, owing to the geographical nature of the land. He thought it was admirable for industrial purposes, first, because of its proximity to the railway, and, secondly, because there was a fairly good road approach. It was well situated in relation to the town itself.

The proposed site was about as obscure a site owing to its contours as could be found in Sidmouth. Mr. Lee Wright said he did not think the neighbourhood would be affected by putting up the gas-works there. Out of 129 houses in the district, 93 objections were received.

Without allowing for the trees which were to be planted, he would say that some of the objectors near the site would have the same view of the gas-works as they now had of the builder's yard. In one or two cases they would only be able to see it from the roof tops of their houses. With the planting of the trees, he doubted if the works would be visible at all. If the works were erected northwards of the proposed site, they would be on higher ground and visible for miles around.

Mr. *J. G. Halse*, J.P. (Chairman of Sidmouth Council), said he had been a member of the Council for 34 years, and Chairman of the Gas Committee for about 21 years. He actively participated in the purchase of the Gas Undertaking in 1911. Even at that time witness urged the removal of the existing works, as they considered the old site unsuitable. From time to time the Council considered various sites, but he had always been of opinion that the most suitable site would be one near the railway station. Nevertheless, he had scoured the district in search of other sites. There was no site in the whole of the Sid Valley as suitable as the proposed site.

The idea of getting a bulk supply from an outside source had been discussed. The estimated cost of about £50,000 for laying a pipe line from Exeter made that scheme out of question.

Witness with other members of the Council met a Dr. Purves, who sent him a private letter offering to pay off the existing loan on the works amounting to £42,000, and give the Council the cleared site. Apparently Dr. Purves contemplated forming a company to erect a gas-works at Tipton St. John to supply gas to the whole of East Devon. With that in view they wished to acquire the undertaking of the Sidmouth Council's gas-works. Mr. Halse said he told Dr. Purves at the meeting which took place that the Council had definitely refused to sell. If he had made them a very big offer they might have thought about it. In addition to the facts he had mentioned previously, Dr. Purves had also offered to pay them £10,000, and then pay the remainder of a total of £100,000 from any profits made in the future. Witness did not consider that offer was worth a moment's consideration, and the Council turned it down unanimously.

Mr. ABADY: This is not Dr. Purves's first adventure into the realms of gas-works and electricity works finance?—I think not.

Mr. Halse said he thought the estimate that there were 250 houses in Sidbury likely to take the gas supply was rather overstated, but, on the other hand, that difference was likely to be made up by additional houses in Sidmouth. The Council could rapidly increase their output of gas as the need arose if they had the new works. With regard to the restrictive covenants on property near the new site, they were to be taken off, and fresh conditions imposed in regard to the site the Council contemplated buying.

Continuing, Mr. Halse said he understood new works would be practically free from all objectionable features. With the exception of the period while the trees were growing, he considered there would be absolutely no detriment to adjoining property whatever.

## The Opposition Case.

The first of the witnesses for the objectors was Major *J. H. Jeudwin*, of White Folly, Harpford, a land agent. He said he could not agree that property owners in the area of the new site would not be adversely affected. It was not fair to say that the only objection to gas-works was unsightliness. There were smoke, fumes, and dust to be considered.

Mr. *L. Field*, a well-known Sidmouth business man and former Councillor and member of the Council Gas Committee, said he favoured removing the works outside the Sidmouth boundaries altogether. It would be a public improvement to remove them from their present position. Mr. Field stated: "I feel that the Council's approaches to the Exeter and Exmouth Gas Companies, made within a fortnight of the enquiry, were made in such a haphazard manner that no proper conclusions could be come to. It would appear that the Council had no desire to get their supply in bulk from larger works. If their proposals were put forward in a friendly manner, he had evidence which led him to believe they might be considered. He had received a letter from a friend who was a member of Exeter Chamber of Commerce, dated July 10, 1936, stating that the position seemed to be that while the Exeter Gas Light and Coke Company were not averse to extension they were not willing to consider anything unofficially, or be drawn into any local controversy."

Mr. ABADY: Do you think the Council, as trustees for the ratepayers, had a duty to improve the gas manufacturing facilities in the face of growing competition?

Mr. *Field*: I accept that. Witness agreed that the new works would naturally be more efficient. He did not suggest that the Council's enquiries of the Exeter and Exmouth Gas Companies were not *bona fide*, but the matter could not be thoroughly investigated at such short notice. If he were in control of the gas-works at Sidmouth, and the sale of the works was a possibility, he would endeavour to increase the manufacture of the gas on the present site. He would increase his storage capacity

with an auxiliary holder in some suitable spot. He thought the Council could find a site for that holder, and suggested the sand pit below the Cemetery.

Questioned by Mr. Abady as to whether he knew the sale of the works was a possibility, Mr. Field said he was sure it had not yet been thoroughly investigated.

Several owners and occupiers of houses in the vicinity of the new site were then called as witnesses.

Of these, Mr. *A. Lancaster Smith* said he had lived in Sidmouth for thirty years, and had been a Councillor for periods amounting to ten years. Alexandria Road was one of the pleasantest roads in the town, giving extensive views of the countryside and sea.

He considered the best solution of the difficulty was to get rid of the undertaking on condition that the works were removed outside the Sidmouth boundary, and the rights of the consumers adequately safeguarded. Continuing his evidence, Mr. Lancaster Smith said he thought gas in Sidmouth was very dear compared with prices in other districts. They were told that there was to be a saving of about £360 a year on the new works on the cost of coal hauling, yet it had not been brought out that the Council were at present getting coal cheaper delivered to the works by road than they could get it by rail and then delivered by road. There was considerable doubt about that item. There was some perturbation in the town as to whether there was adequate supervision of the management of the works. It was a cause for concern that the scheme was now to cost £49,000, which was £5,000 more than the estimate given them last March. There might be further increases by the time the scheme was really brought into being, if the order was granted.

Mr. ABADY: Do you consider the gas-works are badly and inadequately managed?—No.

Do you agree that your object in mentioning these things after my case is closed is to throw doubt on the reliability of the estimate made by Mr. Whitehead?

*Witness:* No. I only say the scheme now amounts to practically £49,000, when the previous scheme was £44,000.

Mr. ABADY: Were you responsible for the insertion of a picture representing the new gas-works in a local paper?—Yes.

Mr. ABADY, producing the paper, said he would hand it to the Inspector. He asked if witness had been active in canvassing the people who had signed the petition, and if in approaching the petitioners he drew their attention to the drawing.

*Witness:* Certainly not. Most of them signed before the picture appeared. He caused it to be inserted because he thought it interesting.

Mr. ABADY: Because you thought it would give them an idea of what you wanted them to think would be put up near their houses?

*Witness:* As the Council were coy in giving elevations I thought the sketch would show approximately where the works would extend. Witness said he did not think there was anything in the drawing which was unfair, having regard to the information which the Council were willing to afford him at the time. He thought the picture of the smoke came out a little blacker than he intended.

Closing the opposition, Mr. WILLIAMS said that enquiry resolved itself into a question of amenities. A substantial amount of feeling had been obvious and conflict of views, but it was fortunate that the Inspector would hold the balance. The views of the minority must not be ignored. The Council's expert admitted the case for the objectors when he said it would be a poor investment for the Council to purchase the site adjoining the proposed site. Mr. Williams pointed out that not one single witness who lived in the area had been called by the promoters in support of the scheme, and suggested that if this order was made, some protection should be afforded to those people by compensation.

Mr. ABADY, on behalf of the promoters, said the proposal to move the works to this site was clearly understood by the townspeople at the 1935 election. With that knowledge the electors of this town elected a large number of representatives who favoured that scheme. He did not say any Council had a mandate to ask the Board of Trade to perpetrate an injustice on anyone, proceeded Mr. Abady. It was for the Inspector to be satisfied that the choice of the site was a reasonable one, having regard to all the information. Was there any real opposition, springing from the real opinion of the people? The opposition was mainly worked up by Mr. Lancaster Smith, without that full consideration of the real facts which should be present and should govern the actions of a public man when he sought to guide public opinion. He suggested it was an absolutely irresponsible thing for a gentleman who put himself up as a public representative to try to frighten those who lived in the neighbourhood of this site, which was at present a builder's yard, by putting a drawing in the paper of a horrible thing, described as "the proposed new gas-works." If he were a person living in one of those streets and had no knowledge of what gas-works were really like and saw that picture, he would also be full of indignation and ready to oppose the scheme. The opposition was worked up on a representation of the type typified by that drawing.

References had been made to compensation, continued Mr. Abady, which were irrelevant, and he did not propose to take part in that issue. In conclusion, Mr. Abady said with regard to the trees, where there was likely to be exposure of something which should be avoided, the Board of Trade advised the planting of suitable trees. It was common practice in appropriate cases.

The Enquiry closed, after sitting for over twelve hours, and the Inspector's decision will be announced in due course.

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# Gas Markets and Manufactures

## Stock Market Report

(For Stock and Share Lists, see later pages)

The volume of business on the Stock Exchange last week became smaller each day as the week progressed, and when the Account finally closed on Friday most markets were in a state of depression. Gilt-edged stocks were particularly weak, and although the sharp drop in prices attracted a few buyers at the close the movement came too late to make any appreciable difference to values. Home rail ordinaries made a brave show and were the turn better, though the prior charges declined further. Industrials were dull and uncertain, with prices generally on the down grade. Commodities fared little better, and though rubbers looked like going ahead at one time the improvement was not maintained. The general feeling was one of relief when the week finished, with hopes of brighter conditions on the opening of the new Account.

In the Gas Market there was good support for the leading stocks, the majority of which contained the full final dividend, though on the whole the volume of business was on a reduced scale, and towards the close prices in many cases became a shade easier. Quotations, however, showed few changes, and it is interesting to note that in contrast to some sections the market was not entirely devoid of appreciation in value. Plymouth and Stonehouse recorded the highest increase with a gain of 5 points to 172½, though the only other increase in the Official List was a further rise of a point in Imperial Continental. On the other hand, Malta and Mediterranean fell another 5, making a total drop of 35 points in the past fortnight. The re-adjustment in this Company's stock is doubtless attributable to the fact that the concession which it owns for the supply of gas to Malta expires in 1952 when the works revert to the local authority. The Company has distributed 10% free of tax since 1929-30. At the Provincial Exchanges, Liverpool ordinary closed fractionally higher at 136, but Newcastle units dropped a further 3d. to 25s. 9d. The Supplementary List again remained unchanged.

## Current Sales of Gas Products

### The London Market for Tar Products.

*Feb.* 1.

Tar Products generally remain unchanged, to-day's values being as follows:

Pitch, nominal, at 34s. per ton f.o.b.
Creosote, 5¾d. to 6d.
Refined tar, 3¾d.
Pure toluole, 2s. 4d. to 2s. 5d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 7d.; and 90/160 pyridine, about 8s. 6d.—all per gallon naked at makers' works.

### Tar Products in the Provinces.

*Feb.* 1.

The average prices of gas-works products during the week were: Gas-works tar, 19s. 3d. to 24s. 3d. Pitch—East Coast, 34s. to 35s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 34s. to 35s.* Toluole, naked, North, 1s. 11d. to 2s. Coal tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5½d. Heavy naphtha, North, 1s. 1½d. to 1s. 2½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅞d. to 5⅛d.; low gravity, 4½d. to 4¾d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 2s. 8d. to 2s. 9d. Naphthalene, £18 to £20. Salts, 90s. to 95s., bags included. Anthracene "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

### Tar Products in Scotland.

GLASGOW, *Jan.* 30.

Business continues active and prices are firm accordingly.

Crude gas-works tar.—The actual value is 35s. to 36s. per ton *ex* works in bulk.

Pitch remains rather dull at 30s. to 32s. 6d. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is at present being held for 3d. per gallon f.o.r. for export, and 3¾d. per gallon *ex* works in buyers' packages for home trade.

Creosote oil.—Available supplies find a ready outlet at the following prices: Specification oil, 5¼d. to 5½d. per gallon; low gravity, 5¼d. to 5½d. per gallon; neutral oil, 5d. to 5¼d. per gallon; all *ex* works in bulk.

Cresylic acid.—Prices are higher on the week's trading and supplies are not at all easily secured. Pale, 97/99%, 2s. 10d. to 3s. per gallon; dark, 97/99%, 2s. 7d. to 2s. 9d. per gallon; and pale, 99/100%, 3s. 2d. to 3s. 5d. per gallon; all *ex* works in buyers' packages.

Crude naphtha.—Value is steady at 5½d. to 6d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha.—90/160 grade is valued at 1s. 3d. to 1s. 4d. per gallon, and 90/190 heavy naphtha at 10½d. to 11½d. per gallon.

Motor benzole can still be secured in quite substantial quantities at 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—Prices are nominal at 6s. to 6s. 6d. per gallon for 90/160 grade, and 7s. to 7s. 6d. per gallon for 90/140 grade.

### Benzole Prices.

These are considered to be the market prices for benzole at the present time:

| | s. | d. | | s. | d. | |
|---|---|---|---|---|---|---|
| Crude benzole | 0 | 9 | to | 0 | 9½ | per gallon at works |
| Motor ,, | 1 | 3 | ,, | 1 | 3½ | ,, ,, ,, |
| 90% ,, | 1 | 4 | ,, | 1 | 4½ | ,, ,, ,, |
| Pure ,, | 1 | 8 | ,, | 1 | 8½ | ,, ,, ,, |

## Contracts Advertised To-Day

**Coal.**
Ashford Gas Department. [p. 290.]
Hereford Gas Department. [p. 290.]

**Concrete Work and Excavation.**
Spenborough Gas Department. [p. 290.]

**Mantles.**
Hereford Gas Department. [p. 290.]

**Oils and Grease.**
Hereford Gas Department. [p. 290.]

**Painting.**
Stoke-on-Trent Gas Department. [p. 290.]

**Pipes (Various) and Fittings.**
Hereford Gas Department. [p. 290.]

**Sulphuric Acid.**
Hereford Gas Department. [p. 290.]

**Wash Coppers.**
Hereford Gas Department. [p. 290.]

## Gas Undertakings' Results

### Weymouth.

The Directors of the Weymouth Consumers' Gas Company submit accounts for the year ended Dec. 31, 1936, showing an increase in gas sales, the amount sold for the year being 1,375,002 therms. This, compared with the previous year, is an increase of 51,035 therms, equivalent to 3·8%. The sales of fittings, both by cash and hire purchase, are again very satisfactory, while the receipts for residuals show a very substantial increase on the previous year. A large section of the Company's area is supplied by a trunk main passing under the Weymouth Harbour. During the past year the Directors have taken the opportunity of duplicating this main, thus removing the possibility of failure in the supply of gas. After providing for the interest on the debenture stocks, the balance at the credit of the net revenue account is £7,448, out of which the Directors recommend the payment of the following dividends: On the ordinary stock at the rate of 6% per annum, less income-tax, less the interim dividend already paid to June 30, 1936; and on the 5½% redeemable preference stock at the rate of 5½% per annum, less income-tax, less the interim dividend already paid to June 30, 1936.

# Gas and coke production with the best advantages of scientific control . . . .

# THE WEST SYSTEMS

- GLOVER-WEST VERTICAL RETORTS
- WESTVERTICAL CARBONIZING CHAMBERS
- COAL AND COKE-HANDLING & PREPARATION

**Carbonizing Plants ordered in 1936 by—**

THE **DUDLEY,** BRIERLEY HILL & DISTRICT GAS CO. (3RD ORDER)
THE **KELSO** GAS COMPANY, LTD.
THE **ALTRINCHAM** GAS COMPANY (3RD ORDER)
THE **BILSTON** GAS LIGHT & COKE COMPANY (2ND ORDER)
THE **GRANGEMOUTH** CORPN. GAS DEPT. (2ND ORDER)
THE **JOHANNESBURG** MUNICIPAL GAS DEPT. (3RD ORDER)
THE **BALLYMENA** U.D.C. GAS DEPARTMENT (2ND ORDER)
THE **WORCESTER** NEW GAS LIGHT CO. (2ND ORDER)
THE **YEADON AND GUISELEY** GAS CO. (2ND ORDER)
THE **CARLISLE** CORPORATION GAS DEPT. (2ND ORDER)
THE **DUMBARTON** CORPORATION GAS DEPT. (2ND ORDER)
THE **BELFAST** CORPORATION GAS DEPT. (6TH ORDER)
THE **DUDLEY,** BRIERLEY HILL & DISTRICT GAS CO. (4TH ORDER)
THE **GALASHIELS** GAS LIGHT COMPANY
THE **CHARD** CORPORATION GAS DEPARTMENT
THE **GUELPH** (ONT.) LIGHT & HEAT COMMRS. (2ND ORDER)
THE **ALLIANCE AND DUBLIN** CONSUMERS' GAS COMPANY (4TH ORDER)
THE **ROTHESAY** CORPORATION GAS DEPT. (3RD ORDER)
THE **NEWCASTLE-UPON-TYNE** AND GATESHEAD GAS COMPANY (5TH ORDER)

THE SOCIETY OF BRITISH GAS INDUSTRIES · 1905 ·

**WEST'S GAS IMPROVEMENT COMPANY, LTD.**

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LONDON: COLUMBIA HOUSE, ALDWYCH, W.C.2 — 'Phone': HOLBORN 4108 : 'Grams': "WESGASCO, ESTRAND, LONDON"

# STOCK AND SHARE LIST

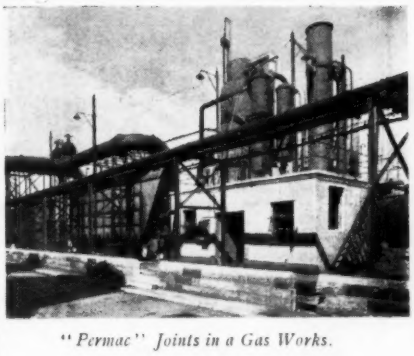
## Official Quotations on the London Stock Exchange

| Issue. £ | Stock or Share | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations Jan. 29. | Rise or Fall on Week. | Transactions, Lowest and Highest Prices During the Week. |
|---|---|---|---|---|---|---|---|---|
| 1,767,439 | Stk. | Sept. 7 | 7⅞ | 8 | Alliance & Dublin Ord. ... | 171—176 | ... | ... |
| 374,000 | ,, | Dec. 14 | 4 | 4 | Do. 4 p.c. Deb. ... | 92—97 | ... | ... |
| 557,655 | ,, | Aug. 10 | 7 | 7 | Barnet Ord. 7 p.c. ... ... | 168—173 | ... | 170½ |
| 300,000 | 1 | Oct. 5 | 1/9⅜ | 1/4⅛ | Bombay, Ltd. ... ... ... | 26/—28/- | ... | ... |
| 179,305 | Stk. | Aug. 10 | 9⅛ | 9⅛ | Bournemouth sliding scale ... | 220—230 | ... | ... |
| 590,407 | ,, | ,, | 7 | 7 | Do. 7 p.c. max. ... | 171—176 | ... | 174—175½ |
| 493,960 | ,, | ,, | 6 | 6 | Do. 6 p.c. Pref. ... | 148—153 | ... | 148½—149½ |
| 50,000 | ,, | Dec. 14 | 3 | 3 | Do. 3 p.c. Deb. ... | 85—90 | ... | ... |
| 262,025 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 104—109 | ... | 105—107½ |
| 335,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 123—128 | ... | ... |
| 357,900 | ,, | Aug. 10 | 7⅛ | 7⅛ | Brighton, &c., 6 p.c. Con. ... | 168—173 | ... | ... |
| 649,955 | ,, | ,, | 6⅞ | 6⅞ | Do. 5 p.c. Con. ... | 154—159 | ... | 156 |
| 205,500 | ,, | ,, | 6 | 6 | Do. 6 p.c. 'B' Pref. | 145—150 | ... | ... |
| 855,000 | ,, | Oct. 5 | 8 | 7 | British Ord. ... ... ... | 157—162 | ... | 159—160 |
| 100,000 | ,, | Dec. 14 | 7 | 7 | Do. 7 p.c. Pref. ... ... | 148—153 | ... | ... |
| 350,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. 'B' Cum. Pref. | 112—117 | ... | ... |
| 120,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 95—100 | ... | ... |
| 450,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 109—114 | ... | ... |
| 200,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 99—102 | ... | ... |
| 100,000 | 10 | 22 May '33 | 6 | 4 | Cape Town, Ltd. ... ... | 1—3 | ... | ... |
| 100,000 | 10 | 6 Nov.'33 | 4½ | 4½ | Do. 4½ p.c. Pref. ... | 1—3 | ... | ... |
| 150,000 | Stk. | Jan. 4 | 4½ | 4½ | Do. 4½ p.c. Deb. ... | 80—85 | ... | ... |
| 626,860 | ,, | July 20 | 6 | 6 | Cardiff Con. Ord. ... ... | 128—133 | ... | ... |
| 237,860 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Red. Deb. | 108—113 | ... | ... |
| 98,936 | 1 | Oct. 19 | 2/- | 2/- | Colombo Ord. ... ... | 1⅛—1⅞ | ... | ... |
| 24,510 | 1 | ,, | 1/4½ | 1/4½ | Do. 7 p.c. Pref. ... | 23/6—25/6 | ... | ... |
| 739,453 | 1 | Oct. 5 | -/11·48 | -/11·48 | Colonial Gas Assn. Ltd. Ord. | 17/6—19/6 | ... | ... |
| 296,144 | 1 | ,, | 1/3·30 | 1/3·30 | Do. 8 p.c. Pref. | 21/—23/- | ... | ... |
| 1,775,005 | Stk. | Aug. 10 | 5 | 5 | Commercial Ord. ... ... | 93—98 | ... | 93½—95 |
| 620,000 | ,, | Nov. 30 | 3 | 3 | Do. 3 p.c. Deb. ... | 81—84 | −2 | 81—82 |
| 286,344 | ,, | Aug. 10 | 5 | 5 | Do. 5 p.c. Deb. ... | 122—127 | ... | 125½—126½ |
| 807,560 | ,, | Aug. 10 | 7 | 7 | Croydon sliding scale ... | 158—163 | ... | 160—162 |
| 644,590 | ,, | ,, | 5 | 5 | Do. max. div. ... ... | 115—120 | ... | 118½—119 |
| 620,385 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb.... ... | 123—128 | ... | 126 |
| 239,000 | ,, | Aug. 10 | 5 | 5 | East Hull Ord. 5 p.c.... ... | 109—113 | ... | ... |
| 184,555 | ,, | Aug. 10 | 6 | 6 | East Surrey Ord. 5.p.c. ... | 128—133 | ... | ... |
| 176,211 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb. ... | 121—126 | ... | ... |
| 250,000 | 1 | Nov. 16 | 4 | 4 | Gas Consolidation Ord. ... | 20/6—22/6 | ... | 21/9—22/1½ |
| 250,000 | 1 | ,, | 4 | 4 | Do. 4 p.c. Red. Cum. Pref. | 19/—21/- | ... | 20/- |
| 19,255,284 | Stk. | Aug. 10 | 5½ | 5½ | Gas Light & Coke 4 p.c. Ord. | 26/3—27/3a | ... | 25/11½—27/- |
| 2,600,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. max. ... ... | 88—91 | −½ | 88—89 |
| 4,477,106 | ,, | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. ... | 104—108 | ... | 104—105½ |
| 8,602,497 | ,, | Nov. 30 | 3 | 3 | Do. 3 p.c. Con. Deb. ... | 84—87 | ... | 85—86½ |
| 3,642,770 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 115—118 | ... | ... |
| 3,500,000 | ,, | ,, | 4½ | 4½ | Do. 4½ p.c. Red. Deb.... | 114—117 | ... | 115—116½ |
| 700,000 | ,, | Sept. 7 | ... | 25/5s | Do. 3½ p.c. Red. Deb.... | 102—104 | ... | ... |
| 270,466 | ,, | Aug. 24 | 6 | 6 | Harrogate New Cons. ... | 128—133 | ... | ... |
| 213,200 | ,, | Aug. 10 | 6 | 6 | Hornsey Con. 3½ p.c. ... | 133—138 | ... | ... |
| 5,600,000 | ,, | Nov. 2 | 12 | 8 | Imperial Continental Cap. ... | 157—162 | +1 | 158—162 |
| 223,130 | ,, | July 20 | 3½ | 3½ | Do. 3½ p.c. Red. Debs.... | 92—97 | ... | 94½ |
| 285,242 | ,, | Aug. 24 | 8⅜ | 8⅜ | Lea Bridge 5 p.c. Ord. ... | 186—191 | ... | ... |
| 11,751 | ,, | ,, | 10 | 8 | Maidstone Gas 5 p.c. Cap. Stk. | 190—200 | ... | ... |
| 63,480 | ,, | Dec. 14 | 3 | 3 | Do. 3 p.c.Prp.Db.Sk. | 79—84 | ... | ... |
| 75,000 | ,, | Nov. 30 | †10 | †10 | Malta & Mediterranean ... | 150—160 | −5 | 150 |
| 392,000 | — | Oct. 1 | 5⅛ | 5⅛ | Metropolitan (of Melbourne) 5½ p.c. Red. Deb. ... ... | 100—105 | ... | ... |
| 231,978 | Stk. | Aug. 24 | 5 | 5 | M.S. Utility 'C' Cons. ... | 111—116 | ... | ... |
| 818,657 | ,, | ,, | 4 | 4 | Do. 4 p.c. Cons. Pref. | 102—107 | ... | ... |
| 360,075 | ,, | Dec. 14 | 4 | 4 | Do. 4 p.c. Deb. ... | 103—108 | ... | ... |
| 148,955 | ,, | ,, | 5 | †5 | Do. 5 p.c. Deb. ... | 121—126 | ... | ... |
| 125,000 | — | Jan. 4 | 3½ | 3½ | Do. 3½ p.c. Rd.Rg.Bds. | 97—100 | ... | ... |
| 675,000 | Stk. | Nov. 16 | †6 | †6 | Montevideo, Ltd. ... ... | 80—85 | ... | ... |
| 225,000 | ,, | Aug. 10 | 7½ | 7½ | North Middlesex 6 p.c. Con. | 170—175 | ... | 170 |
| 396,160 | ,, | Aug. 10 | 5 | 5 | Northampton 5 p.c. max. ... | 110—115 | ... | ... |
| 300,000 | ,, | Nov. 2 | †7 | †9 | Oriental, Ltd.... ... ... | 168—173 | ... | ... |
| 416,617 | ,, | Dec. 14 | 8 | 8 | Plymouth & Stonehouse 5 p.c. | 170—175 | +5 | ... |
| 504,416 | ,, | Aug. 10 | 8½ | 8½ | Portsmouth & Gosport Cons. | 178—183 | ... | ... |
| 241,446 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... | 114—119 | ... | 115 |
| 73,350 | ,, | ,, | ... | 5 | Do. 5 p.c. Pref. ... | 118—123 | ... | ... |
| 363,470 | 1 | Sept. 21 | 1/- | 1/- | Severn Val. Gas Cor. Ld. Ord. | 21/—23/- | ... | ... |
| 454,510 | 1 | ,, | -/10½ | -/10½ | ,, ,, 4½ p.c. Cum. Pref. | 21/—23/- | ... | ... |
| 133,201 | Stk. | Aug. 24 | 5 | 8⅛ | Shrewsbury 5 p.c. Ord. ... | 145—150 | ... | ... |
| 90,000 | 10 | June 8 | ‡3½ | ‡4 | South African... ... ... | 4—5 | ... | ... |
| 1,152,635 | 1 | Sept. 7 | 1/2½ | 1/2½ | South East'n Gas. Cn.Ld. Ord. | 27/—29/- | ... | 27/6 |
| 845,511 | 1 | ,, * | -/10½ | -/10½ | Do. 4½ p.c. Red. Cum. Pref. | 21/—23/- | ... | 21/9—22/6 |
| 200,000 | 1 | ,, | 4 | 4 | Do. 4 p.c. Cum. Pref. ... | 20/6—21/6 | ... | ... |
| 150,000 | Stk. | Aug. 10 | ... | 3½ | Do. 3½ p.c. Red. Deb. ... | 100—102 | ... | ... |
| 6,709,895 | ,, | Aug. 10 | 6½ | 5 | South Met. Ord. ... ... | 117—120 | ... | 115½—119½ |
| 1,135,812 | ,, | ,, | 6 | 6 | Do. 6 p.c. Irred. Pf. ... | 145—150 | ... | 146 |
| 850,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Irred. Pf. ... | 104—107 | ... | ... |
| 1,895,445 | ,, | Dec. 14 | 3 | 3 | Do. 3 p.c. Deb. ... | 82—85 | ... | 82—85 |
| 1,000,000 | ,, | Jan. 4 | 5 | 5 | Do. 5 p.c. Red. Deb.... | 113—116 | ... | ... |
| 1,543,795 | ,, | Aug. 10 | 6 | 6 | South Suburban Ord. 5 p.c.... | 130—135 | ... | 132½—134 |
| 512,825 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref.... | 121—126 | ... | ... |
| 500,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref.... | 102—107 | ... | ... |
| 888,587 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb.... | 122—127 | ... | 124—126 |
| 250,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb.... | 103—108 | ... | ... |
| 427,859 | 1 | Nov. 16 | 1/2½ | 9⅜ | S. Western Gas & Water Ord. | 21/—23/- | ... | 21/6 |
| 160,523 | 1 | Oct. 19 | -/10½ | -/10½ | Do. 4½% Red. Cum. Pref. | 20/6—22/6 | ... | 21/6—22/- |
| 110,000 | Stk. | Dec. 14 | 4 | 4 | Do. 4% Red. Deb. ... | 100—105 | ... | ... |
| 647,740 | ,, | Aug. 10 | 5⅛ | 5 | Southampton Ord. 5 p.c. ... | 113—118 | ... | ... |
| 121,275 | ,, | Jan. 4 | 4 | 4 | Do. 4 p.c. Deb. | 100—105 | ... | 103 |
| 350,000 | ,, | Aug. 10 | 5⅛ | 5⅛ | Swansea 5½ p.c. Red. Pref. ... | 112—117 | ... | 114½ |
| 106,000 | ,, | Jan. 4 | 6⅛ | 6⅛ | Do. 6½ p.c. Red. Deb. ... | 98—101 | ... | ... |
| 94,000 | ,, | ,, | 3⅛ | 3⅛ | Do. 3½ p.c. Red. Deb. ... | 95—100 | ... | ... |
| 1,076,490 | ,, | Aug. 10 | 6⅛ | 6⅛ | Tottenham and District Ord. | 152—157 | ... | 153½—155⅛ |
| 409,835 | ,, | ,, | 5⅛ | 5⅛ | Do. 5½ p.c. Pref.... | 130—135 | ... | ... |
| 62,235 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 120—125 | ... | ... |
| 371,850 | ,, | Nov. 30 | 4 | 4 | Do. 4 p.c. Deb. ... | 102—107 | ... | ... |
| 369,774 | ,, | Aug. 10 | 7 | 7 | Uxbridge, &c., 5 p.c. ... | 165—170 | ... | ... |
| 108,330 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 120—125 | ... | ... |
| 1,340,521 | ,, | Aug. 10 | 7 | 7 | Wandsworth Consolidated ... | 159—164 | ... | 160½—163 |
| 1,371,373 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref ... | 122—127 | ... | 124 |
| 500,000 | ,, | ,, | ... | ... | Do. 4 p.c. Pref. ... | 104½—107½ | ... | 107½ |
| 1,317,964 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb. ... | 125—130 | ... | 127—129 |
| 338,300 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 102—107 | ... | ... |
| 499,735 | ,, | Aug. 10 | 7⅛ | 7 | Watford and St. Albans Ord. | 157—162 | ... | ... |
| 200,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 120—125 | ... | ... |
| 200,000 | ,, | ,, | 5⅛ | 5⅛ | Do. 5½ p.c. Pref. ... | 131—136 | ... | ... |
| 200,000 | ,, | Dec. 14 | 4 | 4 | Do. 4 p.c. Red. Deb. | 100—105 | ... | ... |
| 100,000 | ,, | ,, | 3⅛ | 3⅛ | Do. 3½ p.c. Red.Deb. | 99—102 | ... | ... |

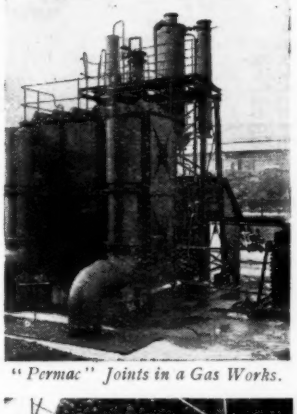
a.—The quotaion is per £1 of Stock. * Ex div. † Paid free of income-tax. ‡ For year. ⅛ Actual.

**Stock and Share List continued overleaf.**

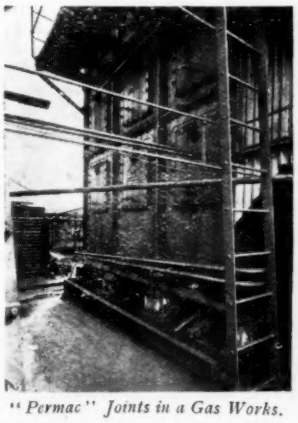

# Such consistently Good Results come only from Experience



*"Permac" Joints in a Gas Works.*



*"Permac" Joints in a Gas Works.*



*"Permac" Joints in a Gas Works.*

**For over 25 years "Permac," the Metal-to-Metal Jointing, has been holding up difficult joints in all parts of the world. There is no substitute for experience.**

**Send for particulars.**

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METAL-TO-METAL JOINTING MATERIAL.

*Beware of cheap imitations.*

*Sole manufacturers:*

**THOMAS & BISHOP LTD.**

**37, Tabernacle St.**

**LONDON, E.C. 2**

*Telephone: Clerkenwell 1056, 0584 (2 lines)*

# STOCK AND SHARE LIST—Cont.

## Stocks Officially Quoted on Provincial Exchanges

| Issue. £ | Stock or Share | When ex-Dividend. | Dividends. Prev. Hf. Yr. % p.a. | Dividends. Last Hf. Yr. % p.a. | NAME. | Quotations. Jan. 29. | Rise or Fall on Week. | Transactions, Lowest and Highest During the Week. |
|---|---|---|---|---|---|---|---|---|
| **BRISTOL EXCHANGE.** | | | | | | | | |
| 347,756 | Stk. | July 20 | 6 | 5 | Bath Cons. ... ... ... | 125—127 | ... | ... |
| 1,667,250 | ,, | July 6 | 5 | 5 | Bristol, 5 p.c. max. ... ... | 119—121 | ... | ... |
| 120,420 | ,, | Dec. 14 | 4 | 4 | Do. 1st 4 p.c. Deb. ... | 102—104 | ... | ... |
| 217,870 | ,, | ,, | 4 | 4 | Do. 2nd 4 p.c. Deb. ... | 101½—103½ | ... | ... |
| 328,790 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... ... | 122—125 | ... | ... |
| 274,000 | ,, | Aug. 10 | 5 | 5 | Newport (Mon.) 5 p.c.max. ... | 110—114 | ... | ... |
| 13,200 | 12 | Sept. 7 | 8½ | 7 | Pontyp'l Gas & W. 10 p.c. 'A' | 13½—14½ | ... | ... |
| 13,600 | 10 | ,, | 6 | 5 | Do. 7 p.c. 'B' | 12—12½ | ... | ... |
| 40,000 | 10 | ,, | 6 | 5 | Do. 7 p.c. 'C' | 12—12½ | ... | ... |
| 140,778 | Stk. | Aug. 10 | 5 | 5 | Weston-super-Mare Cons. ... | 112—114 | ... | ... |
| 64,338 | ,, | Dec. 14 | 4 | 4 | Do. 4 p.c. Deb. | 98—101 | ... | ... |
| 33,340 | ,, | ,, | 7½ | 7½ | Do. 7½ p.c. Deb. | 160—163 | ... | ... |
| **LIVERPOOL EXCHANGE.** | | | | | | | | |
| 157,150 | Stk. | Aug. 10 | 6½ | 5 | Chester 5 p.c. Ord. ... ... | 107—112 | ... | ... |
| 92,500 | ,, | Dec. 14 | 4½ | 4 | Do. 4 p.c. Pref. ... ... | 98—102 | ... | ... |
| 32,540 | ,, | ,, | 3 | 3½ | Do. 3½ p.c. Deb.... ... | 90—95 | ... | ... |
| 41,890 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 99—103 | ... | ... |
| 2,167,410 | ,, | Aug. 24 | 6 | 6 | Liverpool 5 p.c. Ord. ... | 135—137 | +½ | ... |
| 245,500 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Red. Pref. ... | 101—106 | ... | ... |
| 306,083 | ,, | Jan. 4 | 4 | 4 | Do. 4 p.c. Deb. ... | 103—105 | ... | ... |
| 106,280 | ,, | July 20 | 10 | 10 | Preston 'A' 10 p.c. ... ... | 198—208 | ... | ... |
| 188,219 | ,, | ,, | 7 | 7 | Do. 'B' 7 p.c. ... ... | 137—147 | ... | ... |
| **NEWCASTLE EXCHANGE.** | | | | | | | | |
| 122,577 | Stk. | Aug. 10 | 8 | 8 | Blyth 5 p.c. Ord. ... ... | 166—168 | ... | ... |
| 732,000 | ,, | Aug. 10 | 5 | 5 | Hartlepool G. & W. Cn. & New | 125—127 | ... | ... |
| 2,061,315 | ,, | Aug. 10 | 5½ | 5 | Newcastle & Gateshead Con. | 25 6—26/-*a* | —/3 | ... |
| 682,856 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... | 104—105 | ... | ... |
| 776,706 | ,, | Jan. 4 | 3½ | 3½ | Do. 3½ p.c. Deb. ... | 99—101 | —1 | ... |
| 277,285 | ,, | Nov. 2 | 5 | 5 | Do. 5 p.c. Deb. '43... | 108—109 | ... | ... |
| 209,820 | ,, | Aug. 10 | 8½ | 8½ | South Shields Con. ... ... | 172—174 | ... | ... |
| 299,542 | ,, | Aug. 10 | 6 | 6 | Sunderland 6 p.c. max. ... | 140—142 | ... | ... |
| **NOTTINGHAM EXCHANGE.** | | | | | | | | |
| 542,270 | Stk. | Aug. 10 | 10 | 7 | Derby Con. ... ... ... | 185—195 | ... | ... |
| 55,000 | ,, | Dec. 14 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 100—105 | ... | ... |
| 84,750 | ,, | Feb. 17 | 5 | 12 | Long Eaton 'A' Ord. ... | ... | ... | ... |
| 50,000 | ,, | ,, | 4 | 10 | Do. 'B' Ord. ... | ... | ... | ... |
| 20,000 | 10 | Dec. 14 | 5 | 5 | Do. 5 p.c. Pref. ... | 10—12 | ... | ... |
| 80,000 | Stk. | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 117—122 | ... | ... |
| **SHEFFIELD EXCHANGE.** | | | | | | | | |
| 10,000 | Stk. | Aug. 10 | 10 | 10 | Great Grimsby 'A' Ord. ... | 220—230 | ... | ... |
| 6,500 | ,, | ,, | 10 | 10 | Do. 'B' Ord. ... | 220—230 | ... | ... |
| 79,000 | ,, | ,, | 10 | 10 | Do. 'C' Ord. ... | 205—215 | ... | ... |
| 1,806,339 | ,, | Aug. 24 | 6 | 6 | Sheffield Cons. ... ... | 146—148 | ... | ... |
| 95,000 | ,, | Jan. 4 | 4 | 4 | Do. 4 p.c. Deb.... ... | 101—104 | ... | ... |

*a* The quotation is per £1 of Stock.

## Supplementary List of Stocks and Shares not Officially Quoted

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 202,152 | Stk. | Nov. 2 | 5 | 25/-*a* | Ascot Ord. ... ... ... | 118—123 | ... | ... |
| 128,182 | ,, | Jan. 4 | 5 | 5 | Do. 5 p.c. Pref. ... ... | 115—120 | ... | 120 |
| 312,083 | 1 | Nov. 16 | 5 | 5 | Assd. Gas and Water Ord. ... | 21/6—23/6 | ... | ... |
| 326,071 | 1 | ,, | 4½ | 4½ | Do. 4½ p.c. Cum. Pref. ... | 21/—23/- | ... | ... |
| 150,000 | Stk. | Sept. 21 | ... | 3½ | Do. 3½ p.c. Red. Deb. ... | 98—101 | ... | ... |
| 17,000 | ,, | Aug. 24 | 8 | 8 | Bognor Orig. Ord. 'A' ... | 175—185 | ... | ... |
| 62,210 | ,, | ,, | 8 | 8 | Do. New Addl. 'A' ... | 175—185 | ... | ... |
| 87,160 | ,, | ,, | 7 | 7 | Do. New 7 p.c. max. ... | 145—150 | ... | ... |
| 37,440 | ,, | Aug. 10 | 10 | 10 | Cam. Univ. & Town 10 p.c.max. | 205—215 | ... | ... |
| 125,970 | ,, | ,, | 7 | 7 | Do. 7 p.c. max. ... ... | 155—160 | ... | ... |
| 39,025 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... ... | 108—113 | ... | ... |
| 65,000 | ,, | Aug. 10 | 8½ | 7½ | Eastbourne 'A' 5 p.c. ... | 175—180 | ... | ... |
| 198,000 | ,, | ,, | 7 | 6 | Do. 'B' 3½ p.c. ... ... | 142—147 | ... | ... |
| 112,312 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 118—123 | ... | 122—122½ |
| 130,000 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 122—127 | ... | ... |
| 24,000 | 30 | Aug. 10 | 8½ | 8½ | Great Yarmouth 8½ p.c. max. | 51—56 | ... | ... |
| 59,400 | 30 | ,, | 7½ | 7½ | Do. 7½ p.c. max. ... ... | 42—45 | ... | ... |
| 51,160 | Stk. | Dec. 14 | 5½ | 5½ | Do. 5½ p.c. Deb. ... ... | 123—128 | ... | ... |
| 152,600 | ,, | Sept. 7 | 8 | 8 | Guildford Cons. ... ... | 200—210 | ... | ... |
| 54,055 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 114—119 | ... | ... |
| 68,250 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 120—125 | ... | ... |
| 156,600 | ,, | Aug. 24 | 7½ | 7½ | Hampton Court Cons. ... | 173—178 | ... | ... |
| 107,960 | 10 | Oct. 5 | 5½ | 4 | Mid Kent Ord. ... ... | 8½—9½ | ... | ... |
| 230,940 | Stk. | Aug. 10 | 10 | 10 | Oxford & District Ord. ... | 215—225 | ... | 217½—220 |
| 47,112 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 118—123 | ... | ... |
| 50,000 | ,, | ,, | 6 | 6 | Do. 6 p.c. Red. Pref. ... | 113—118 | ... | ... |
| 126,193 | ,, | Nov. 16 | 7½ | 7½ | Peterborough Ord. ... ... | 162—172 | ... | ... |
| 64,990 | ,, | Sept. 7 | 6½ | 7½ | Redditch Ord. ... ... | 133—143 | ... | ... |
| 166,850 | ,, | Aug. 10 | 9 | 8 | Romford Ord. ... ... | 160—170 | ... | ... |
| 60,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... ... | 97—100 | ... | ... |
| 44,000 | ,, | Sept. 21 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 120—125 | ... | ... |
| 10,950 | ,, | Aug. 24 | 8 | 8 | Ryde Ord. ... ... ... | 165—170 | ... | ... |
| 136,191 | ,, | Aug. 10 | 7 | 5 | Scarborough Ord. ... ... | 126—136 | ... | ... |
| 27,825 | ,, | Aug. 24 | 8 | 8 | Shanklin & Ventnor Cons. ... | 170—180 | ... | ... |
| 40,643 | ,, | Sept. 21 | 7 | 7 | Slough Ord. ... ... ... | 156—161 | ... | ... |
| 221,000 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb.... ... | 116—121 | ... | ... |
| 28,872 | 1 | Nov. 2 | 5½ | 5½ | S. Midland Gas Cpn. Ltd. Ord. | 22/—24/- | ... | ... |
| 28,866 | 1 | Sept. 7 | 4½ | 4½ | Do. 4½ p.c. Red. Cum. Pref. | 22/—24/- | ... | ... |
| 137,730 | Stk. | Aug. 10 | 7 | 7 | Southgate & Dist. 7 p.c. max. | 151—156 | ... | ... |
| 62,500 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 120—125 | ... | ... |
| 117,228 | ,, | Aug. 10 | 6 | 5 | Swindon Cons. ... ... | 110—115 | ... | ... |
| 60,425 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 118—123 | ... | ... |
| 64,380 | ,, | Dec. 14 | 5 | 5 | Torquay and Paignton 5 p.c. Pf. | 115—120 | ... | ... |
| 750,000 | 1 | Oct. 5 | 5·52d.*a* | 4 | Utd. Kingdom Gas Cpn. Ord. | 21/6—22/6 | ... | 21/9—22/3 |
| 606,270 | 1 | ,, | 2½ | 2½ | Do. 4½ p.c. Prefd. Ord. ... | 20/—22/- | ... | 20/6—21/3 |
| 936,338 | 1 | Nov. 16 | 4½ | 4½ | Do. 4½ p.c. Cum. Pref. ... | 21/6—23/6 | ... | 22/3 |
| 600,000 | Stk. | Sept. 21 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. ... | 99—102 | ... | 101 |
| 130,000 | ,, | Aug. 10 | 8 | 5 | Wakefield Ord. ... ... | 140—145 | ... | ... |
| 81,650 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... ... | 105—110 | ... | ... |
| 82,000 | ,, | July 20 | 6 | 6 | Weymouth Ord. ... ... | 105—110 | ... | ... |
| 98,384 | ,, | Aug. 10 | 6 | 6 | Wolverhampton 6 p.c. Pref.... | 127—132 | ... | ... |
| 160,000 | ,, | Dec. 14 | 5½ | 5½ | Do. 5½ p.c. Rd. Db | 110—115 | ... | ... |
| 370,000 | ,, | July 20 | 6 | 4 | York Cons. ... ... ... | 110—120 | ... | ... |
| 90,000 | ,, | Dec. 14 | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 108—113 | ... | ... |
| 133,640 | ,, | July 20 | 6½ | 6½ | Yorktown (Cam.) 5 p.c ons. | 140—150 | ... | ... |
| 120,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 123—128 | ... | ... |
| 35,000 | ,, | Dec. 14 | 5½ | 5½ | Do. 5½ p.c. Deb.... ... | 128—133 | ... | ... |

*a* Actual.

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